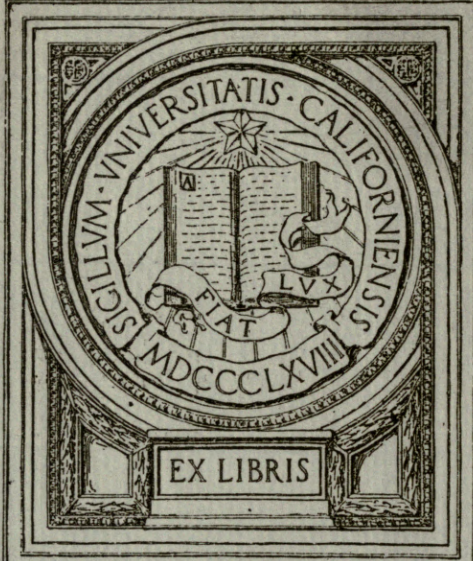


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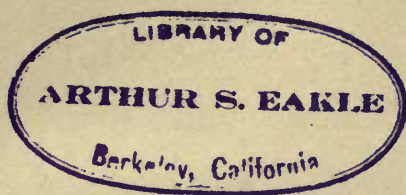
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# SECOND APPENDIX

TO THE

## SIXTH EDITION

OF

# DANA'S SYSTEM OF MINERALOGY

BY

EDWARD S. DANA

PROFESSOR OF PHYSICS AND CURATOR OF MINERALOGY, YALE UNIVERSITY

AND

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YALE UNIVERSITY

COMPLETING THE WORK TO 1909

NEW YORK

JOHN WILEY & SONS

LONDON: CHAPMAN & HALL, LIMITED

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## PREFATORY NOTE

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THIS Second Appendix to the Sixth Edition of the System of Mineralogy issued in 1892 is designed to make the work complete up to the beginning of 1909. Its preparation was begun by the Senior Editor soon after the publication of the First Appendix in 1899, and carried forward at intervals down to 1906, when he was finally compelled to relinquish it. The work was resumed by the Junior Editor in 1907 and carried through to completion.

During the ten years of mineralogical investigation which this appendix covers, a large amount of material has been published. An evidence of this is to be found in the two hundred new names which are given in the classified list in the Introduction. About sixty of these new names on account of the completeness of their descriptions seem to have a warrant for their acceptance as new species. The other names are either of imperfectly described minerals or variety names of well-recognized species.

The descriptions of the new species included in this book are given concisely but completely. It was found, however, impracticable to follow the plan adopted in the System and the First Appendix of recalculating all the angles and crystal constants of the new species. This has been done in a few cases, but in the majority of the descriptions the figures of the authors have been accepted without verification. In the cases of some of the new species with complex crystals it has been impossible to give the complete lists of the forms identified upon them. The method followed has been to give the more common and prominent forms and to indicate the number of those not listed.

For an explanation of the *Abbreviations* made use of in the case of periodicals, also of the crystallographical, optical and chemical symbols employed, reference is made to the Introduction to the System (1892), pp. xlv-li and pp. xiii-xl. General abbreviations are explained on pp. lxi-lxiii.

The bibliography, while not intended to be exhaustive, contains, it is thought, the titles of all the important volumes published between 1899 and 1909.

YALE UNIVERSITY,  
NEW HAVEN, CONN., July 1, 1909.



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## CLASSIFIED LIST OF NEW NAMES.

### I. NATIVE ELEMENTS, Min. pp. 2-32.

- Arsensulfurite (p. 9). Var. Sulphur, Min. p. 8.  
QUISQUEITE (p. 87). Chiefly C and S.  
Souesite (p. 11). Nickel-iron alloy, near Awaruite, Min. p. 29.

### II. SULPHIDES, TELLURIDES, ARSENIDES, ETC., Min. pp. 33-108.

- ARSENSCHWEFEL (p. 9),  $As_2S_3 + H_2O$ .  
PATRONITE (p. 79),  $VS_4$  (?).  
**Keweenawite** (p. 59),  $(Cu, Ni, CO)_2As$ .  
Stibiodomeykite (p. 97). Var. of Domeykite, Min. p. 44.  
MOHAWKITE (p. 70),  $(Cu, Ni, CO)_3As$ .  
LEDOUXITE (p. 62),  $Cu_4As$ .  
**Rickardite** (p. 89), Sanfordite (p. 90),  $Cu_4Te_3$ .  
KALGOORLITE (p. 58),  $HgAu_2Ag_5Te_6$ .  
Coolgardite (p. 31). Telluride of Au, Ag, Hg. Probably a mixture.  
**Chalmersite** (p. 27),  $Cu_2S.Fe_4S_3$ . Near Chalcocite, Min. p. 55.  
**Teallite** (p. 104),  $PbS.SnS_2$ .  
Bravoite (p. 19). Nickeliferous Pyrite, Min. p. 84.  
BADENITE (p. 12),  $(Co, Ni, Fe)_2(As, Bi)_3$ .  
Speculite (p. 95). A silver, gold telluride near Sylvanite, Min. p. 103.  
VON DIESTITE (p. 110). Telluride of silver and bismuth.

### III. SULPHO-SALTS, Min. pp. 109-151.

- HISTRIXITE (p. 52),  $7Bi_2S_3.2Sb_2S_3.5CuFeS_2$ .  
**Hutchinsonite** (p. 53),  $(Tl, Ag, Cu)_2S.As_2S_3 + PbS.As_2S_3$  (?).  
**Trechmannite** (p. 107),  $Ag_2S.As_2S_3$ , rhombohedral.  
**Smithite** (p. 95),  $Ag_2S.As_2S_3$ , monoclinic.  
LIVEINGITE (p. 64),  $5PbS.4As_2S_3$ .  
**Baumhauerite** (p. 13),  $4PbS.3As_2S_3$ .  
SELIGMANNITE (p. 92),  $Cu_2S.2PbS.As_2S_3$  (?) Near Bournonite, Min. p. 126.  
LENGENBACHITE (p. 62),  $6PbS.(Ag, Cu)_2S.2As_2S_3$  (?)  
Antimon-luzonite (p. 7). Var. Enargite, Min. p. 147.  
SULVANITE (p. 101),  $3Cu_2S.V_2S_3$ .

### IV. CHLORIDES, BROMIDES, IODIDES, Min. pp. 152-182.

#### 1. ANHYDROUS CHLORIDES, ETC.

- Kleinite** (p. 59). Mercury ammonium chloride.  
Chlornatrokalite (p. 28). A mixture of Halite, Min. p. 154, and Sylvite, Min. p. 156.  
**Chlormanganokalite** (p. 28),  $4KCl.MnCl_2$ .  
Chloragryrite (p. 28). Same as Cerargyrite, Min. p. 158.

- Bromargyrite (p. 20). Same as Bromyrite, Min. p. 159.  
 Iodembolite (p. 55),  $\text{Ag}(\text{Cl}, \text{Br}, \text{I})$ .  
**Rinneite** (p. 89),  $\text{FeCl}_2 \cdot 3\text{KCl} \cdot \text{NaCl}$ .  
**Villiaumite** (p. 110),  $\text{NaF}$ .  
**Cryolithionite** (p. 33),  $\text{Li}_3\text{Na}_3\text{Al}_2\text{F}_{12}$ . To follow Cryolite, Min. p. 166.

## 2. OXYCHLORIDES.

- Terlinguaite** (p. 104),  $\text{Hg}_2\text{ClO}$ .  
**Egglestonite** (p. 37),  $\text{Hg}_2\text{Cl}_2\text{O}$ .  
 Rafaelite (p. 87). Same as Paralaurionite, App. I, p. 50.  
**Paratacamite** (p. 79),  $\text{CuCl}_2 \cdot 3\text{Cu}(\text{OH})_2$ . Near Atacamite, Min. p. 172.  
 KOENENITE (p. 60). Justite (p. 58). Oxychloride of Al and Mg.

## V. OXIDES, Min. pp. 183-260.

- Pseudochalcedonite (p. 87). Var. of Chalcedony, Min. p. 188.  
**Montroydite** (p. 71),  $\text{HgO}$ .  
 CADMIUMOXID (p. 21),  $\text{CdO}$ .  
 MELANOCHALCITE (p. 67), Copper oxide with  $\text{SiO}_2$ ,  $\text{CO}_2$  and  $\text{H}_2\text{O}$ .  
 CORONADITE (p. 32),  $(\text{Mn}, \text{Pb})\text{Mn}_3\text{O}_7$ .  
 HOLLANDITE (p. 52),  $m(\text{Ba}, \text{Mn})_2\text{MnO}_5 + n\text{Fe}_4(\text{MnO}_6)_3$ .  
 HYDROGÖTHITE (p. 54),  $3\text{Fe}_2\text{O}_3 \cdot 4\text{H}_2\text{O}$ .  
 Esmeraldaite (p. 40), Hydrous ferric oxide.<sub>II</sub>  
 Brostenite (p. 20). Manganite of Mn and Fe.

## VI. 1. CARBONATES, Min. pp. 261-309.

- Glendonite (p. 46). Calcite pseudomorphs after Glauberite.  
 KUTNOHORITE (p. 61),  $(\text{Ca}, \text{Mn}, \text{Mg}, \text{Fe})\text{CO}_2$ .  
 Manganospherite (p. 66). Manganiferous Siderite, Min. p. 276.  
 Lacroisite (p. 61). Mixture of Rhodochrosite and Rhodonite.  
 Conchite (p. 31). Same as Aragonite, Min. p. 281.  
 Zeyringite (p. 114). Var. of Aragonite, Min. p. 281.  
 Leesbergite (p. 62),  $2\text{MgCO}_3 \cdot \text{CaCO}_3$  (?).  
**Cordylite** (p. 31),  $(\text{BaF})(\text{CeF})\text{Ce}(\text{CO}_3)_3$ . Related to Parisite, Min. p. 290.  
**Synchisite** (p. 102),  $\text{CeFCa}(\text{CO}_3)_2$ .  
 Rutherfordine (p. 90),  $\text{UO}_2\text{CO}_3$ .  
**Ancylite** (p. 5),  $4\text{Ce}(\text{OH})\text{CO}_3 \cdot 3\text{SrCO}_3 \cdot 3\text{H}_2\text{O}$ .  
**Tychite** (p. 108),  $2\text{MgCO}_3 \cdot 2\text{Na}_2\text{CO}_3 \cdot \text{Na}_2\text{SO}_4$ . Related to Northupite, App. I, p. 49.  
 ROSASITE (p. 89),  $2\text{CuO} \cdot 3\text{CuCO}_3 \cdot 5\text{ZnCO}_3$ .  
 BLEIMALACHITE (p. 16),  $2\text{CuCO}_3 \cdot \text{PbCO}_3 \cdot \text{Cu}(\text{OH})_2$ .  
 OTAVITE (p. 77), basic cadmium carbonate.  
**Artinite** (p. 9),  $\text{MgCO}_3 \cdot \text{Mg}(\text{OH})_2 \cdot 3\text{H}_2\text{O}$ .  
 Giorgiosite (p. 45),  $4\text{MgCO}_3 \cdot \text{Mg}(\text{OH})_2 \cdot 4\text{H}_2\text{O}$ .  
**Brugnatellite** (p. 21),  $\text{MgCO}_3 \cdot 5\text{Mg}(\text{OH})_2 \cdot \text{Fe}(\text{OH})_3 \cdot 4\text{H}_2\text{O}$ .

## VI. 2. SILICATES.

## A. ANHYDROUS SILICATES, Min. pp. 310-562.

- Leucosphenite** (p. 64),  $\text{Na}_3\text{Ba}(\text{TiO})_2(\text{Si}_2\text{O}_5)_3$ . Related to Eudidymite, Min. p. 313.  
 Isorthose (p. 57). Var. of Orthoclase, Min. p. 315.  
 Paracelsian (p. 78),  $\text{Ba}_3\text{Al}_3\text{Si}_3\text{O}_{31}$ . Probably var. of Celsian, App. I, p. 15.  
 Clinostatite (p. 30). Magnesium pyroxene.



Pigeonite (p. 81), Violaite (p. 110), Ægirine-hedenbergite, Blanfordite (p. 16). Var. of Pyroxene, Min. p. 352.

Kunzite (p. 61). Var. of Spodumene, Min. p. 366.

Torrensit (p. 107). Probably a mixture of Rhodonite, Min. p. 378, and Rhodochrosite, Min. p. 278.

Pseudowollastonite (p. 83).

**Alamosite** (p. 1),  $\text{PbSiO}_3$ . Near Wollastonite, Min. p. 371.

**Schizolite** (p. 92),  $\text{HNa}(\text{Ca}, \text{Mn})_2(\text{SiO}_3)_3$ .

Soretite (p. 95), Széchenyiite (p. 102), Tschernichéwite (p. 108), Osannite (p. 77), Winchite (p. 111). Var. of Amphibole, Min. p. 385.

**Rhönite** (p. 88),  $(\text{Ca}, \text{Na}_2, \text{K})_3 \text{Mg}_4 \text{Fe}_2 \text{Fe}_3 \text{Al}_4 (\text{Si}, \text{Ti})_6 \text{O}_{30}$ . Related to Ænigmatite, Min. p. 403.

Oehrnite (p. 76),  $6(\text{Mg}, \text{Fe}, \text{Ca})\text{O} \cdot 6\text{SiO}_2 \cdot \text{H}_2\text{O}$ .

WEINBERGERITE (p. 111),  $\text{NaAlSiO}_4 + \text{FeSiO}_3$  (?).

**Taramellite** (p. 103),  $\text{Ba}_4 \text{Fe}^{\text{II}} \text{Fe}^{\text{III}} \text{Si}_{10} \text{O}_{31}$ .

**Hackmanite** (p. 48),  $\text{Na}_4 [\text{Al}(\text{NaS})] \text{Al}_2 (\text{SiO}_4)_3$ . Member of Sodalite Group.

Viellaurite (p. 110). A mixture of Tephroite, Min. p. 457, and Rhodochrosite, Min. p. 278.

Pseudomeionite (p. 83). Var. of Meionite, Min. p. 467.

Howdenite (p. 53). Var. of Chiastolite, Min. p. 496.

Californite (p. 24). Var. of Vesuvianite, Min. p. 477.

Naëgite (p. 72). Zircon (Min. p. 482) containing  $\text{UO}_3$ ,  $\text{ThO}_2$ ,  $\text{Nb}_2\text{O}_5$ ,  $\text{Ta}_2\text{O}_5$ ,  $\text{Y}_2\text{O}_3$ .

Johnstonotite, Landerite (p. 61), Xalostocite, Rosolite (p. 90). Var. of Garnet, Min. p. 437.

DITYTITE (p. 16),  $7(\overset{\text{I}}{\text{R}}_2\text{O} + \overset{\text{II}}{\text{R}}\text{O}) \cdot 4\text{Al}_2\text{O}_3 \cdot 5\text{SiO}_2$ ;  $\overset{\text{I}}{\text{R}} = \text{H}, \text{Li}, \text{Na}, \text{K}$ ;  $\overset{\text{II}}{\text{R}} = \text{Ca}, \text{Be}, \text{Mg}$ .

**Hibschite** (p. 52),  $\text{H}_4\text{CaAl}_2\text{Si}_2\text{O}_{10}$ .

**Spurrite** (p. 97),  $2\text{Ca}_2\text{SiO}_4 \cdot \text{CaCO}_3$ .

Cerepidote (p. 25). Same as Allanite, Min. p. 522.

**Leucophœnicite** (p. 63),  $\text{Mn}_5(\text{MnOH})(\text{SiO}_4)_3$ .

**Hellandite** (p. 50),  $\text{Ca}_2\text{R}_3[\overset{\text{III}}{\text{R}}(\text{OH})_2]_3(\text{SiO}_4)_4$ .

**Molybdophyllite** (p. 70),  $\text{RSiO}_4 + \text{H}_2\text{O}$ ;  $\text{R} = \text{Pb}, \text{Mg}$ .

Stokesite (p. 100),  $\text{H}_4\text{CaSnSi}_3\text{O}_{11}$

**Beckelite** (p. 14),  $\text{Ca}_3(\text{Ce}, \text{La}, \text{Di})_4\text{Si}_4\text{O}_{18}$ .

**Grandidierite** (p. 47),  $7\text{SiO}_2 \cdot 11(\text{Al}, \text{Fe})_2\text{O}_3 \cdot 7(\text{Mg}, \text{Fe}, \text{Ca})\text{O} \cdot 2(\text{Na}, \text{K}, \text{H})_2\text{O}$ .

SILICOMAGNESIOFLUORITE (p. 94), a fluosilicate of Ca and Mg.

SERENDIBITE (p. 93), a basic silicate of Al, Ca, Mg.

#### B. OTHER SILICATES, CHIEFLY HYDROUS SPECIES, Min. pp. 563-711.

**Bakerite** (p. 12),  $8\text{CaO} \cdot 5\text{B}_2\text{O}_3 \cdot 6\text{SiO}_2 \cdot 6\text{H}_2\text{O}$

**Hillebrandite** (p. 52),  $\text{Ca}_2\text{SiO}_4 \cdot \text{H}_2\text{O}$ .

REYERITE (p. 88), Ca, Al silicate with  $\text{H}_2\text{O}$ .

ZEOPHYLLITE (p. 113). Calcium silicate with  $\text{H}_2\text{O}$ . Near Gyrolite, Min. p. 566.

**Agnolite** (p. 1),  $\text{H}_2\text{Mn}_3(\text{SiO}_4)_4 \cdot \text{H}_2\text{O}$ .

Pseudophillipsite (p. 83), Var. Phillipsite, Min. p. 579.

**Astrolite** (p. 10),  $(\text{Na}, \text{K})_2\text{Fe}(\text{Al}, \text{Fe})_2(\text{SiO}_3)_5 \cdot \text{H}_2\text{O}$  (?).

Pseudomesolite (p. 83). Var. of Mesolite, Min. p. 605.

Bavenite (p. 14),  $\text{Ca}_3\text{Al}_2\text{Si}_6\text{O}_{18} \cdot \text{H}_2\text{O}$ .

MELITE (p. 68),  $2(\text{Al}, \text{Fe})_2\text{O}_3 \cdot \text{SiO}_2 \cdot 8\text{H}_2\text{O}$ .

LOTRITE (p. 65),  $4\text{SiO}_2 \cdot 2\text{R}_2\text{O}_3 \cdot 3\text{RO} \cdot 2\text{H}_2\text{O}$ .

LASALLITE (p. 61),  $\text{MgO} \cdot \text{Al}_2\text{O}_3 \cdot 5\text{SiO}_2 \cdot 3\frac{1}{2}\text{H}_2\text{O}$  (?).

- Irvingite (p. 57). Var. of Lepidolite, Min. p. 624.  
 MORAVITE (p. 71),  $H_4Fe_2(Al,Fe)_4Si_7O_{24}$ .  
 Pycnochlorite (p. 84). Var. of Chlorite, Min. p. 643.  
 BRUNSVIGITE (p. 21),  $6SiO_2 \cdot 2Al_2O_3 \cdot 9MgO \cdot 8H_2O$ .  
 Stilpnochloran (p. 99). Alteration product of Thuringite, Min. p. 657.  
 SPODIOPHYLLITE (p. 96),  $(Na_2K_2)_2(Mg,Fe)_3(Fe,Al)_2(SiO_3)_8$ .  
 TÆNIOLITE (p. 102),  $(K,Li)_2O \cdot MgO \cdot 3SiO_2 \cdot 2H_2O$  (?).  
 Radiotine (p. 87), Hampdenite (p. 49), Hampshireite (p. 49), Ricolite (p. 89), Nemaphyllite (p. 74). Var. of Serpentine, Min. p. 669.  
 NEPOUITE (p. 75),  $3(Ni,Mg)O \cdot 2SiO_2 \cdot 2H_2O$ .  
 Greenalite (p. 47). Near Glauconite, Min. p. 683.  
 TERMIERITE (p. 105), a hydrated Al silicate.  
 Hyaloalophane (p. 54). Var. of Allophane, Min. p. 693.  
 Dubuissonite (p. 36). Near Montmorillonite, Min. p. 690.  
 PLANCHÉITE (p. 81),  $15CuO \cdot 12SiO_2 \cdot 5H_2O$ .  
 MÜLLERITE (p. 72),  $Fe_2Si_3O_9 \cdot 2H_2O$ .  
 Morencite (p. 72), a silicate of ferric iron with  $H_2O$ .  
 ALOISITE (p. 3), a hydrous silicate containing  $FeO$ ,  $CaO$ ,  $MgO$ ,  $Na_2O$ .

## TITANO-SILICATES, TITANATES, Min. pp. 711-724.

- Carlosite (p. 24). Same as Neptunite, App. I, p. 49.  
 Narsarsukite (p. 73), acid titano-silicate of ferric iron and sodium.  
 Benitoite (p. 14),  $BaTiSi_3O_9$ .  
 Lorenzenite (p. 65),  $Na_2(TiO)_2Si_7O_{17}$ .  
 Yttrocraosite (p. 112), a hydrous titanite of the yttrium earths and thorium.  
 Delorenzite (p. 34),  $2FeO \cdot UO_2 \cdot 2Y_2O_3 \cdot 24TiO_2$  (?).  
 Davidite (p. 34),  $TiO_2$  with Fe, U, V, Cr and rare earths.

## VI. 3. NIOBATES, TANTALATES, Min. pp. 725-746.

- Marignacite (p. 66). Var. of Pyrochlore, Min. p. 726.  
 Chalcolamprite (p. 26),  $RNb_2O_6 \overset{II}{F}_2 \cdot \overset{II}{R}SiO_4$ . Allied to Pyrochlore, Min. p. 726.  
 Neotantalite (p. 74). Near Tantalite, Min. p. 731.  
 STRÜVERITE (p. 100),  $FeO \cdot (Ta,Nb)_2O_5 \cdot 4TiO_2$  (?).  
 LORANSKITE (p. 65),  $Ta_2O_5, Y_2O_3, Ce_2O_3, CaO, FeO, ZrO, H_2O$ .  
 ENDEIOLITE (p. 38),  $RNb_2O_6(OH)_2 \cdot \overset{II}{R}SiO_3$  (?).  
 EPISTOLITE (p. 39),  $Nb_2O_5, SiO_2, TiO_2, Na_2O, H_2O, F$  (?).  
 ERIKITE (p. 39),  $SiO_2, P_2O_5, ThO_2, (Ce,Le,Di)_2O_3, Al_2O_3, Na_2O, H_2O$  (?).  
 BRITHOLITE (p. 19). Silicate and phosphate of Ce metals and Ca.  
 Blomstrandine-Priorite (p. 17). Niobate and tantalate of Y, Er, Ce, U.  
 Robellazite (p. 89). Contains Va, Nb, Ta, W, Al, Fe and Mn.

## VI. 4. PHOSPHATES, ARSENATES, ETC., Min. pp. 747-861.

- Hussakite (p. 53). Var. of Xenotime, Min. p. 748.  
 Graftonite (p. 47),  $R_3P_2O_8$ ; R = Fe, Mn, Ca.  
 Bowmannite (p. 19). Same as Hamlinite, Min. p. 762.  
 Florencite (p. 42),  $3Al_2O_3 \cdot Ce_2O_3 \cdot 2P_2O_5 \cdot 6H_2O$ . Near Hamlinite, Min. p. 762.  
 Georgiadésite (p. 45),  $Pb_3(AsO_4)_2 \cdot 3PbCl_2$ .

- Petterdite (p. 80). Same as Mimetite, Min. p. 771.  
**Tarbuttite** (p. 103),  $Zn_3P_2O_8 \cdot Zn(OH)_2$ .  
 SCHETELITE (p. 91),  $Mg(NH_4)_2H_2(PO_4)_2 \cdot 4H_2O$ .  
**Parahopeite** (p. 78),  $Zn_3P_2O_8 \cdot 4H_2O$ . Near Hopeite, Min. p. 808.  
**Anapaite** (p. 5), Tamanite (p. 103),  $(Ca,Fe)_3(PO_4)_2 \cdot 4H_2O$ .  
 Paravivianite (p. 79). Var. Vivianite, Min. p. 814.  
**Purpurite** (p. 83),  $2(Fe,Mn)PO_4 \cdot H_2O$ .  
 GORCEIXITE (p. 46),  $BaO \cdot 2Al_2O_3 \cdot P_2O_5 \cdot 5H_2O$ .  
 STOFFERTITE (p. 99),  $2CaO \cdot P_2O_5 \cdot 6\frac{1}{2}H_2O$ . Near Brushite, Min. p. 828.  
 PALMERITE (p. 78),  $HK_2Al_2(PO_4)_3 \cdot 7H_2O$ .  
 KERTSCHENITE (p. 59). A hydrated basic ferric phosphate.  
 CERULEITE (p. 25),  $CuO \cdot 2Al_2O_3 \cdot As_2O_3$ .  
 PODOLITE (p. 82),  $3Ca_3(PO_4)_2 \cdot CaCO_3$ .  
 HARTTITE (p. 50),  $(Sr,Ca)O \cdot 2Al_2O_3 \cdot P_2O_5 \cdot SO_3 \cdot 5H_2O$ .

## VI. 5. BORATES, URANATES, Min. pp. 874-893.

- Thorianite** (p. 106),  $ThO_2 \cdot U_3O_8$ .  
 HULSITE (p. 53),  $10(Fe,Mg)O \cdot 2Fe_2O_3 \cdot 1SnO_2 \cdot 3B_2O_3 \cdot 2H_2O$ .  
 Paigete (p. 78). Probably same as Hulsite, above.

## VI. 6. SULPHATES, CHROMATES, Min. pp. 894-981.

- Palmierite** (p. 78),  $3(K,Na)_2SO_4 \cdot 4PbSO_4$  (?).  
**Vanthoffite** (p. 109),  $3Na_2SO_4 \cdot MgSO_4$ .  
 BELLITE (p. 14). Lead chromate containing arsenious oxide, etc.  
 ARZRUNITE (p. 9),  $(Pb_2O)SO_4 \cdot 3(CuCl_2 \cdot H_2O) \cdot Cu(OH)_2$  (?).  
 DOUGHTYITE (p. 36),  $Al_2(SO_4)_3 \cdot 5Al_2(OH)_6 \cdot 21H_2O$ .  
**Stelznerite** (p. 97),  $CuSO_4 \cdot 2Cu(OH)_2$ .  
 FERROPALLIDITE (p. 42),  $FeSO_4 \cdot H_2O$ .  
 SCLEROPASTHITE (p. 92). A hydrous sulphate of ferrous iron and chromium.  
 Cuprogoslarite (p. 33). Var. Goslarite, Min. p. 939.  
**Boothite** (p. 18),  $CuSO_4 \cdot 7H_2O$ .  
**Natrochalcite** (p. 73),  $Na_2SO_4 \cdot Cu_4(OH)_2(SO_4)_2 \cdot 2H_2O$ .  
 Ferrorömerite (p. 42), Zinkrömerite (p. 114). Var. of Römerite, Min. p. 959.  
 Janosite (p. 57). Same as Copiapite, Min. p. 964.  
 Palacheite (p. 78). Var. of Botryogen, Min. p. 972.  
 Natrojarosite (p. 73). Var. of Jarosite, Min. p. 974.  
 Plumbojarosite (p. 82). Var. of Jarosite, Min. p. 975.  
 Moissanite (p. 70), CSi.



## APPENDIX II.

ACMITE, Min., pp. 364, 1046; App., p. 1. — Crystals of ægirite from Narsarsuk, Greenland, have been described by Flink, *Mémoires Grönl.*, **24**, 70, 1901; from Kororsuak, Greenland, with new form (221); Böggild, *Min. Grönl.*, 379.

Ægirite occurs as a constituent of mariupolite (elaolite-syenite) on the shore of the Sea of Azov (anal.), Morozewicz, *Min. petr. Mitth.*, **21**, 240, 1902. Anal. of acmite from nepheline-syenite, Montreal; Harrington, *Trans. Roy. Soc. Canada*, **11**, (3), 25, 1905.

Ægirite and riebeckite rocks occur in the neighborhood of Adowa and Axum, Abyssinia; Prior, *Min. Mag.*, **12**, 255, 1900.

ADAMITE, Min., p. 786. — Description of crystals (with anal.) from Monte Valerio, Campiglia Marittima, Italy; Aloisi, *Proc. Soc. Tosc.*, Nov. 17, 1907.

ÆNIGMATITE, Min., p. 403; App., p. 2. — Occurs as an essential constituent of certain basalts (æniigmatite-basalts) especially in the southern Rhön; Soeliner, *Centralblt. Min.*, 206, 1906. Widespread occurrence of *cosyrite* in pantellerites in Choa, in Afar and on the plateaus of Somali and Abyssinia, East Africa; Arsandaux, *C. R. Sci. de la Mission Duchesne-Fournet*, Paris, 1906.

**Agnolite**, *Agnolithe*: — E. Breussig, *Jb. Min., Beil.* **13**, 265; *Bull. Min. Soc.*, **23**, 36, 1900.

A mineral from Schemnitz called mangano-calcite by Breithaupt, was later proven to consist of a mixture of a rhombohedral carbonate and a silicate (cf. *Min.*, p. 278). The silicate has been studied and named agnolite.

Triclinic. In radiating fibrous masses. Cleavage  $\parallel$  length of fibers. H. = 5. G. = 3.054–3.067. Luster vitreous. Color flesh red to rose.

Comp.  $H_2Mn_3(SiO_3)_4 \cdot H_2O$ .

Anal.:	SiO <sub>2</sub>	FeO	MnO	CaO	MgO	CO <sub>2</sub>	H <sub>2</sub> O
I.	42.15	1.12	35.88	8.22	0.51	6.14	6.37 = 100.39
II.*	49.29	43.26					7.45 = 100.00

\* After deducting carbonates of lime and magnesia and recalculating.

Associated with carbonates of calcium, magnesium, manganese and iron, with quartz, sphalerite and pyrite. Name derived from *ἀγνοεω* (not recognized).

AIKINITE, Min., p. 129. — Anal. of material from Beresowsk, Urals; Guillemain, [*Inaug.-Diss.*, Breslau, 1898], *Zs. Kr.*, **33**, 75.

ÅKERMANITE, Min., p. 476. — Double refraction studied by Hlawatsch, *Min. Mitth.*, **23**, 420, 1904. An attempt to synthesize it in a melt consisting of only CaO and SiO<sub>2</sub> failed; Day and Shepherd, *Am. J. Sc.*, **22**, 280, 1906.

**Alamosite**. C. Palache and H. E. Merwin, *Am. J. Sci.*, **27**, 399, 1909.

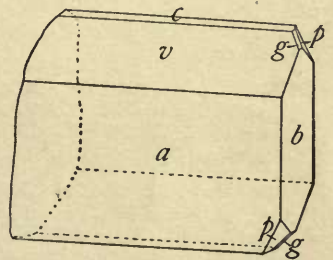
Monoclinic.  $a : b : c = 1.375 : 1 : 0.924$ .  $\beta = 84^\circ 10'$ . Forms:  $c$  (001),  $a$  (100),  $b$  (010),  $m$  (110),  $v$  (101),  $g$  (011),  $p$  (121),  $r$  (121). Angles:  $cv = 32^\circ 02'$ ;  $cg = 42^\circ 36'$ ;  $am = 53^\circ 50'$ .

In radiating fibrous aggregates, occasionally in minute slender crystals, elongated parallel to  $b$ .

Cleavage perfect  $\parallel b$  (010). G. = 6.488. H. = 4.5. Luster adamantine. Colorless or white. Ax. pl.  $\parallel b$  (010). Refraction and double refraction high.

Comp. —  $PbSiO_3$ ;  $PbO$ , 78.68;  $SiO_2$ , 21.32.

Anal. (Merwin) =  $SiO_2$ , 21.11;  $PbO$ , 78.13;  $CaO$ , tr.;  $FeO$ , .09; *Insol.*, .08; *Undet.*, .53; total, 99.94.



Fuses at 3 to greenish yellow bead, colorless when cold.

Lead reactions on charcoal. Sol. in  $\text{HNO}_3$ , yielding silica jelly.

Found associated with quartz, iron oxide, cerussite, leadhillite and wulfenite on specimens from an undeveloped prospect near Alamos, Sonora, Mexico.

Closely related to *wollastonite* in crystal forms and composition.

**ALBERTITE**, Min., p. 1020. — On an asphalt from McGee Creek valley and Impson valley in Indian Territory; Taff, Am. J. Sc., 8, 219, 1899.

**ALBITE**, Min., pp. 327, 1025; App., p. 2. — **Cryst.** — Melzer (Zs. Kr., 40, 571) gives in tabular form the results of the crystallographic studies on albite by previous investigators, describes and figures crystals from Nadabula and from his measurements derives the following:  $a : b : c = 0.6350 : 1 : 0.5578$ ;  $\alpha = 94^\circ 6'$ ,  $\beta = 116^\circ 36\frac{1}{2}'$ ,  $\gamma = 87^\circ 52'$ .

Dreyer and Goldschmidt (Medd. om Grönland, 34, 1907) give a description of fine crystals from Greenland, with an exhaustive discussion of the forms and elements of the mineral. From their measurements the authors derive the following:  $a : b : c = 0.6373 : 1 : 0.5599$ ,  $\alpha = 94^\circ 18'$ ,  $\beta = 116^\circ 41'$ ,  $\gamma = 87^\circ 37'$ . They give a new table of angles for the faces of albite, using these fundamentals. The following new forms were identified on the Greenland crystals: (350), (041), (051)?, (332), (211), (312), (291)?, ( $\bar{1}51$ ), ( $\bar{1}52$ ); on Greenland crystals see also Bøggild, Min. Grönl., 460, 1905.

Crystals from Zöptau figured, Min. Mitth., 21, 348; Neuwirth, Min. Mitth., 23, 263, [Zs. d. mähr. Landmus. Brüm, 39, 1904], Zs. Kr., 42, 411. Crystals from Lake Baikal; Jeremejew, Zs. Kr., 32, 494. Twins from Schirm, and Retteneegg; Milch, Jb. Min., 1, 152, 154, 1900. Crystals from Haddam Neck, Conn., show the forms  $Z$  (120),  $W$  (111),  $X$  (241),  $Y$  (311). Bowman, Min. Mag., 13, 115, 1902; from Comba Perægüe, Piedmont; Zambonini, Centralblt. Min., 117, 1903. Crystals from marble of Carrara with chem. and opt. study; D'Achiardi, Att. Soc. Tosc. Sc., Mem. 22, 1906; from L. Como; Repossi, Rend. Acc. Linc., 15, (1), 508, 1906; from Lyon Mt., Clinton Co., N. Y.; Whitlock, N. Y. State Mus. Bull., 107, 66, 1907. Crystallographic and optical study of albite from Morro Velho and Greenland; Grosspietsch, Min. Mitth., 27, 353, 1908.

Pseudomorphs after laumontite from Evje, Sätersdalen, Norway; Schei, [Nyt. Mag., 43, 137, 1905]; Zs. Kr., 43, 639.

**Opt.** — Studies by Viola, Albite from Carrara, Zs. Kr., 32, 113; from Wallhomthörl, Amelia, albite-oligoclase from Bakersville, periclone from Weidalp and Kramkogel, Zs. Kr., 32, 305. Optical orientation discussed with measurements on albite from Amelia; Becke, Min. Mitth., 19, 321; Viola, Zs. Kr., 32, 318; Min. Mitth., 20, 199; Optical studies on albite from amphibole diabase in Murra dist., Sardinia (with anal.); Viola, Zs. Kr., 43, 202; Boll. Com. Geol. d'Italia, 6, 106, 1905; from granites of Sardinia (with anal.); Riva, Att. Acc. Sc., Napoli, 12, No. 9, 1905.

**Anal.** — From San Pablo, Calif.; Blasdale, Uni. Calif. Bull. Dept. Geol., 2, 11, 327, 1901; from Amelia, Va.; Erben and Ceipek, Min. Mitth., 20, 85.

**Occ.** — From Mokruscha Mt., near Mursinka, Russia; Worobieff, [Verh. russ. min. Ges., 42, Prot. 52, 1905]; Zs. Kr., 43, 71; in granite from Montorfano; Tacconi, Rend. Acc. Linc., 14, (2), 83, 1905; in chalk from Ortola, Massa, Italy; Aloisi, [Proc. Soc. Tosc., 15, 42, 1906]; Zs. Kr., 44, 659.

Effect of ammonium chloride upon; Clarke and Steiger, U. S. G. S., Bull. 207, 1902; Zs. Kr., 38, 697.

**ALGODONITE**, Min., p. 45. — A specimen from the Pewabic mine, in the Quincy amygdaloid bed, L. Superior, analyzed by Koenig, Am. J. Sc., 10, 447, 1900, gave:

G. = 8.383 As 16.08, Cu 83.72, (Fe, Ni, Co) 0.08 = 99.88. On the fresh fracture has the color and texture of razor-steel, tarnishes chocolate-brown, tough. The specific gravity obtained is near the calculated value and much higher than the value given by Genth (7.62). Another specimen from the Champion mine gave Koenig: As 16.55, Cu 83.53 = 100.18, Am. J. Sc., 14, 414, 1902.

*Mohawk-algodonite*, Koenig, Am. J. Sc., 14, 414, 1902, is regarded as an intimate mixture of these two species.

An artif. material containing some silver, named *argento-algodonite*; Koenig, Proc. Am. Phil. Soc., 42, 229.

**Alith.** — Portland cement clinkers show in microscopic sections several crystalline mineral substances called *alith*, *belith*, *celith*, *felith*. Of these alith is the most common; its probable composition is given as  $x(3\text{CaO} \cdot \text{SiO}_2) \cdot 9\text{CaO} \cdot \text{Al}_2\text{O}_3$ . See Törnebohm, Zs. Kr., 32, 610, 1900 [Stockholm, 1897].

**ALLANITE**, Min., p. 522; App., p. 2. — Crystals in granite of Sardinia; Riva, Att. Acc. Sc., Napoli, 12, No. 9, 1905; from biotite-granite on Hiei mountain, Japan; Hiki, Mem. College of Sci and Eng., Kyoto Imperial Uni., 1, 1, 1903.

**Anal.** of bucklandite from the Achmatovsk mines in the Urals; Antipoff; Vh. Min. Ges. St. Pet., 37, Prot. 45, 1899.

Occurrence at Ävigait and Kara Akungnait, Greenland; Bøggild, Min. Grönl., 259, 1905.

**Aloisiite**; Luigi Colomba, *Rend. Acc. Linc.*, **17**, (2), 233, 1908.

A hydrous silicate acting as a cement in tuff found at Fort Portal, Uganda. Amorphous, brown to violet in color. Anal.:

SiO <sub>2</sub>	FeO	CaO	MgO	Na <sub>2</sub> O	H <sub>2</sub> O
24.52	20.56	26.50	11.08	9.96	6.95 = 99.57

\* After deducting impurities and CaCO<sub>3</sub>.

The water is considered as basic and the general formula given as (R'', R<sub>2</sub>')<sub>2</sub>SiO<sub>6</sub>. Name derived from Aloisius, a Latin form of Luigi.

**ALTAITE**, *Min.*, p. 51; *App.*, p. 2. — In crystals, octahedrons with *a* (100) and *β* (322) with gold in the Birney pocket mine, Tuolumne Co., Cal. (anal. by Schaller); Eakle, *Bull. G. Univ. Cal.*, **2**, 324, 1901.

Occurs sparingly with other tellurides at Kalgoorlie, West Australia; Spencer, *Min. Mag.*, **13**, 278, 1903.

**ALUM**, *Min.*, p. 951. — On the growth of crystals; Weyberg, *Zs. Kr.*, **31**, 510; *ibid.*, **36**, 40; also Chevalier, *Min. Mag.*, **14**, 134; Becker and Day, *Proc. Wash. Acad. Sci.*, **7**, 283, 1905; on variation of angles on alum crystals; Miers, *Zs. Kr.*, **39**, 220.

**ALUMYTE**. — G. H. Kinahan, [*Jour. R. Geol. Soc. Ireland*, **8**, 66, 1889]; [*Trans. Manchester Geol. Soc.*, **23**, 165, 1895]; *Min. Mag.*, **12**, 378. Alum clay ("bauxite") of Co. Antrim, Ireland.

**ALUNITE**, *Min.*, p. 974; *App.*, p. 2. — On the relation of alunite to jarosite, natrojarosite, plumbojarosite, see *jarosite*. Varieties of alunite containing soda (*natroalunite*, Hillebrand and Penfield, *Am. J. Sc.*, **14**, 218, 220, 1902) have been described by Cross (4.32Na<sub>2</sub>O) from Rosita Hills, Colorado (*ib.*, **41**, 472, 1891), and Hurlburt (4.41Na<sub>2</sub>O) from Red Mountain, Colorado (*ib.*, **48**, 130, 1894, *App.*, p. 2).

Occ. with anal. from Réalmont, Tarn, France; Ternier, *Bull. Soc. Min.*, **31**, 215, 1908.

**ALUNOGEN**, *Min.*, p. 958. — Anal. from Cripple Creek, Colo.; Hobbs, *Amer. Geol.*, **36**, 185, 1905; *Zs. Kr.*, **43**, 394. Found as a deposit at the Doughty Springs and at Alum Gulch in Colorado; anal.; Headden, *Proc. Col. Sc. Soc.*, **8**, 62, 1905. See also *doughtyite*. Anal. of material from Zolfo Grotto, Mesino, Italy; Zambonini, *Rend. Acc. Sci.*, Napoli, Dec., 1907.

**AMALGAM**, *Min.*, p. 23. — Sjögren has described two varieties from Sala, Sweden; var. A in crystals is Ag<sub>2</sub>Hg<sub>3</sub>, var. B, massive, is Ag<sub>5</sub>Hg<sub>6</sub>; analyses by R. Mauzelius, *G. För. Förh.*, **22**, 187, 1900.

**AMBLYGONITE**, *Min.*, p. 781. — Two analyses of material from Montebras are given by Lasne, *C. R.*, **132**, 1191, 1901. Occurs massive (anal.) at the lepidolite mine near Pala, San Diego Co., Cal.; Schaller, *Am. J. Sc.*, **17**, 191, 1904. Occurrence near Sumjám in Pádar district, Kashmir; Mallet [*Rec. Geol. Sur. India*, **32**, 228, 1905]; *Zs. Kr.*, **43**, 620.

**AMPHIBOLE**, *Min.*, pp. 385, 1026; *App.*, p. 3.

**Cryst.** — Small crystals found associated with pyroxene, biotite, chrysolite, leucite, apatite, sodalite, hainyn, titanite, in volcanic bombs from Cappuccini di Albano, Italy; Zambonini, *Zs. Kr.*, **37**, 369. Twelve forms were observed and the following axial ratio calculated: *a* : *b* : *c* = 0.55051 : 1 : 0.29470; *β* = 74° 35' 24". Small crystals from the cavities in syenite near Biella; *idem*; *ib.*, **40**, 231. The crystals are complex in habit, showing 13 different forms, one being new, *B* (132). Angle (110) : (132) = 79° 38', meas., 79° 45' 33", calc. The calculated constants for these crystals are *a* : *b* : *c* = 0.54501 : 1 : 0.29439; *β* = 75° 4' 13". An analysis is given and the relation between chemical composition and the crystallographic constants discussed. Crystals formed at eruption of Vesuvius in 1906; see under *Vesuvius*. Crystals from Lyon Mt., Clinton Co., N. Y.; Whitlock, *N. Y. State Mus. Bull.*, **107**, 66, 1907.

**Opt.** — Refractive indices of hornblende in inclusions of Augite-Andesite lava from Bellenberges near Mayen; Gaubert, *Bull. Soc. Min.*, **28**, 187, 1905; Optical study of amphiboles occurring in glaucophane schists of California with discussion of classification of group; Murgoci, *Bull. Uni. Calif.*, **4**, 15, 359, 1906. Var. *pargasite* from Grenville, Canada, and Pargas, Finland (with new anal.), studied optically with discussion of variation in optical constants of amphiboles of different composition. Kreuz, *Min. Mitth.*, **27**, 247, 1908. Optical constants of rock forming amphiboles and hornblendes from various localities; Duparc and Pearce, *Bull. Soc. Min.*, **31**, 109, 1908.

**Chem. Comp.** — Penfield and Stanley, *Am. J. S.*, **23**, 23, 1907; *Zs. Kr.*, **43**, 233, give new analyses (1) *tremolite*, Richville, N. Y., (2) Lee, Mass., (3) *actinolite*, Greiner, Tyrol, (4) Russell, N. Y., (5) Kragerø, Norway, (6) Pierrepont, N. Y., (7) *hornblende*, Renfrew, Ontario, (8) Edenville, N. Y., (9) Cornwall, N. Y., (10) Monte Somma, Italy, (11) Bilin, Bohemia, (12) Grenville, Quebec. The authors' conclusions as to the composition of amphibole are (1) that it is a metasilicate, (2) that fluorine and hydroxyl are isomorphous with the protoxides, (3) that the presence of sesquioxides is explained by their introduction into the molecule in the form of various bivalent radicals.

New analyses (see below) of amphibole resembling *kaersutite* from island of Linosa (for which name *linosite* is suggested) and of *kaersutite* from Kaersut, Umanak Fjord, Greenland, with optical study; Washington and Wright, Am. J. Sc., **26**, 187, 1908. Discussion of chem. comp. of amphiboles given. Anal. by Washington.

	SiO <sub>2</sub>	TiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	FeO	MnO	NiO	MgO	CaO
I. Linosa	40.85	8.47	9.89	8.85	3.96	0.12	0.10	12.47	12.16
II. Kaersut	39.52	10.31	11.22	1.22	8.81	0.06	—	13.31	10.93
	Na <sub>2</sub> O	K <sub>2</sub> O	H <sub>2</sub> O	F					
	2.01	0.63	0.19	0.28	= 99.98				
	2.95	1.07	0.59	—	= 100.00*				

\* Corrected for presence of 0.77% of apatite.

Study of the rôle of water in *tremolite* with new analyses of material from Ham Island, Alaska; Ossinger, Gouverneur, Russell and Edwards, N. Y. Also analyses of *kupfferite* from Edwards, N. Y., and *diopside* from Ham Island. Conclusion reached that water is not chemically combined in *tremolite* but is to be regarded rather as dissolved water in a solid solution. Allen and Clement, Am. J. Sc., **26**, 101, 1908.

**Anal.** — *Tremolite* from Bistrau, Bohemia; Kovář [Abh. Böhm Ak., **28**, 1899]; Zs. Kr., **34**, 704: — from Pisek, Bohemia; Krejci, Ber. böhm. Gess. Wiss., xlv, 1899; *hornblende* from volcanic bomb found on the island of St. Christopher; Fels., Zs. Kr., **37**, 460; from Granatilla, Cabo de Gata; Pfeil, [Inaug. Diss. Heidelberg, 1901]; Centralbl. Min., 143, 1902; *amphibole* from Grenville, Quebec, containing 2.8% fluorine; Harrington, Am. J. S., **15**, 392, 1903; from near Easton, Pa.; Eyerma, Amer. Geol., **34**, 43, 1904; *hornblende* from Lukow, Bohemia; Hibsche, Min. Mitth., **24**, 271, 1905; also Hampel, ib., **27**, 271, 1908; "*grammatite*" from Statouist in southern Urals; Smirnov, [Travaux Soc. Imp. Nat. St. Pétersbourg, Sect. géol. et min., **33**, 5, 45, 1905]; Zs. Kr., **44**, 93; *dannemorite* from Macskamező, Hungary; Kosmat and v. John, Zs. prakt. Geol., **13**, 305-325, 1905; amphibole, with anal., from Cevadaes, Portugal; Hlawatsch, Festschrift zum siebzigsten Geburtstage von Harry Rosenbusch, p. 68, 1906.

A blue amphibole is described by L. L. Fermor [Rec. Geol. Sur. India, **31**, 235, 1904], Zs. Kr., **42**, 390, as occurring in a schist associated with quartz, calcite and a black oxide of manganese. Prismatic crystals 6<sup>mm</sup> in length. Pleochroic, a pale reddish lilac, b paler lilac, c blue. Shows zonal structure evidently due to varying composition, with corresponding variation in extinction angle  $\alpha : \epsilon$  from 16° to 70°. G. = 2.86. Secondary blue amphibole occurring in a kersantite in Co. Down, Ireland, noted by H. J. Seymour, Geol. Mag., **7**, 257, 1900. Occurrence of fibrous amphibole (with anal.) in spinel rock on island of Elba; P. Aloisi, Proc. Soc. Tosc., July, 1908.

Hornblende occurring in a hornblende gabbro, from Pavone, near Ivrea, Piedmont, Italy, is described and an analysis given by Van Horn, Amer. Geol., **21**, 370, 1898; Zs. Kr., **32**, 600. Hornblendes occurring as rock constituents in the coast range near Berkeley, California; Blasdale, Uni-Calif. Bull. Dept. Geol., **2**, 11, 327, 1901. Tremolite from Campo longo, Tessin; Mann, [Inaug. Diss., Leipzig, 1904]; Zs. Kr., **42**, 666.

Actinolite as pseudomorph after diopside from Kragerö, Norway, with anal.; S. Hillebrand, Min. Mitth., **27**, 272, 1908. Derived from pyroxene, which see.

Nephrite from New Zealand with analyses, Dieseldorff; Centralbl. Min., 334, 1901; from Bodensee, Kalkowsky, Ber. Abh. Naturwiss. Ges. Isis, **28**, 1907. Historical with bibliography; Berwerth, Min. Mitth., **24**, 228, 1905.

See *Asbestos*.

*Edenite*. — Occ. in upper Vallone delle Rovine, Italy, with anal.; Roccati, Riv. min. cristall. ital., **32**, 12, 1905.

*Hudsonite* from Cornwall, N. Y., formerly classed as a pyroxene, is proven by Weidman, Am. J. Sc., **15**, 227, 1903, to be an amphibole. An optical description and a new analysis are given.

*Soretite* is an aluminous amphibole from the anorthite-diorite rocks of Koswinsky in the north Ural; Duparc and Pearce, Mem. Soc. Phys. Genève, **34**, 1902; Bull. Soc. Min., **26**, 126, 1903. Occurs in short prismatic crystals with *b* (010), *m* (110) but not terminated. G. = 3.223. Refraction indices:  $\alpha = 1.6627$ ,  $\beta = 1.6765$ ,  $\gamma = 1.6856$ . Birefringence negative.  $\gamma - \alpha = 0.0228$ .  $2V = 82^\circ 30'$  obs. Extinction of  $\gamma$  on *b* = 17°. Pleochroism deep green, green, pale greenish yellow.

Analysis, Gabaglio:

	SiO <sub>2</sub>	TiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	FeO	MnO	CaO	MgO	K <sub>2</sub> O	Na <sub>2</sub> O	Ign.
$\frac{2}{2}$	40.52	1.71	10.99	9.64	9.83	tr.	12.33	11.82	0.68	2.38	0.50 = 100.40

*Crossite*. The blue amphibole occurring at Silver Cliff, Colo., and thought by Palache (Bull. G. Univ. Calif., **1**, 181, 1894) to be the same as *crossite*, is said to be *crocidolite*, instead; Murgoci, Am. J. Sc., **20**, 143, 1905.

*Széchényiite* is an amphibole occurring with jadeite from Central Asia, collected by Count Széchényi (1877-1880) and examined by J. Krenner, Zs. Kr., **31**, 502, 1899.



G. = 3.033. Color light greenish brown to brownish or blackish green; pleochroism feeble. Extinction on *m* (cleavage)  $14^{\circ} 12'$ , on *b* (010)  $16^{\circ} 16'$ . An analysis by Loczka gave:

SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	FeO	MgO	CaO	Na <sub>2</sub> O	K <sub>2</sub> O	H <sub>2</sub> O	
55.02	4.53	1.04	3.28	20.36	8.00	6.71	1.52	0.51	= 100.97

*Tschernichévite* is the name given by Duparc and Pearce, Arch. Sci. Phys. Nat., Genève, **23**, 1, 1907; C. R. **144**, 763, 1907; to an amphibole found in a magnetite bearing quartzite in northern Urals. It shows very strong pleochroism, *a* = deep violet, *b* = pale greenish yellow, *c* = intense blue green. Probably near riebeckite or arfvedsonite.

*Osannite*, name given by Hlawatsch, Festschr. H. Rosenbusch, 76, 1906, to a soda-amphibole between riebeckite and arfvedsonite in which ax. pl. is  $\perp$  to (010) and  $B_{xac}$  nearly coincides with axis *c*. Found in amphibole-gneiss at Cevadaes, Portugal. Named after Prof. A. Osann of Freiberg, Baden.

*Winchite*; name given to a blue amphibole near tremolite from manganese mines of Central India. Named after H. J. Winch. Fermor [Trans. Min. Geol. Inst. India, **1**, 79, 1906]; Min. Mag., **14**, 413, 1907.

*Artificial*. In investigating the synthetic production of a series of minerals of the composition MgSiO<sub>3</sub>, E. T. Allen, F. E. Wright and J. K. Clement, Am. J. Sc., **22**, 385, 1906, succeeded in making microscopic crystals which they determined to be amphibole. Preparation of Nordenkiöldine; Ouvrard, C. R. **143**, 315, 1906.

ANALCITE, Min., p. 595; App., p. 3. — Crystals from basalt of East Greenland; Böggild, [Medd. om Grönl., **28**, 99]; Zs. Kr., **43**, 636; from Scottish localities; Goodchild, [Trans. Geol. Soc., Glasgow, **12**, Suppl., 1-68, 1903]; Zs. Kr., **45**, 307; (with anal.) from Ben Lomond, N. S. W.; Anderson, Rec. Aus. Mus., **6**, 418, 1907.

Effect of low temperatures on optical properties; Panichi, [Mem. Acc. Linc., **4**, 389, 1902]; Zs. Kr., **40**, 88.

Anal. of material from nepheline-syenite, Montreal; Harrington, Trans. Roy. Soc. Canada, **11**, (3), 25, 1905; composition discussed; Clarke and Steiger, Am. J. Sc., **8**, 251, 1899. Chem. constitution; McNeil, Jour. Amer. Chem. Soc., **28**, 594, 1906. Anal. of material from Seisser Alp in Tyrol with discussion of composition; Baschieri, Att. Soc. Tosc., **24**, 1908.

Occurrence in rocks. J. W. Evans, Quar. Jour. Geol. Soc., **57**, 38, 1901, describes analcite as forming the isotropic base to a monchiquite from Mount Girnar Junagarh, Kathiawar. A. Pelikan, Mitth., **25**, 113, describes analcite as a primary constituent of an analcite-nephelinite-phonolite from Schönfeld near Kamnitz, Bohemia, and of an analcite phonolite from Kubatschkaberge, northwest from Praskowitz. Noted by H. Proboscht, Centralbl. Min., **79**, 1904, as occurring in the center of altered olivine crystals in an analcite-melaphyre from Pizmeda.

**Anapäite**. A. Sachs, Ber. Ak., Berlin, 1902, p. 18. Tamanite, S. P. Popoff, Zs. Kr., **37**, 267, 1902. Tschirwinski, [Ann. Géol. Min. Russ., **7**, 28, 1904]; Zs. Kr., **43**, 77.

Triclinic. Axis  $\bar{a} : \bar{b} : \bar{c} = 0.8757 : 1 : 0.5975$ ;  $\alpha = 132^{\circ} 22'$ ,  $\beta = 106^{\circ} 47'$ ,  $\gamma = 83^{\circ} 28'$ . Forms: *a* (100), *c* (001), *m* (110), *M* ( $\bar{1}\bar{1}0$ ), *o* ( $\bar{1}\bar{1}1$ ).

Angles:  $ac = 73^{\circ} 10'$ ,  $am = 44^{\circ} 55'$ ,  $aM = 52^{\circ} 20'$ ,  $co = 52^{\circ} 35'$ . Crystals tabular.  $\parallel a$  (100). Cleavage *a*, perfect. H. = 3.5. G. = 2.81-2.85. Color green white. Extinction on *a* (100),  $15^{\circ}$  with *c*. Ax. angle about  $127^{\circ}$ .

Composition  $(Ca, Fe)_3(PO_4)_2 \cdot 4H_2O$ .

Analyses: 1. Sachs, l. c.; 2. Popoff, l. c.; 3. Loczka, Zs. Kr., **37**, 438, 1902.

G	P <sub>2</sub> O <sub>5</sub>	FeO	CaO	H <sub>2</sub> O	
1. 2.81	35.51	18.07	27.77	18.47	= 99.82
2. 2.812 $\frac{2}{3}$	34.50	20.00	27.72	18.33	= 100.55
3. 2.85	34.36	17.49	28.32	18.64	Fe <sub>2</sub> O <sub>3</sub> 0.84, CO <sub>2</sub> 0.62 = 100.27.

From the limonite mines of Zelesnyj Rog near Anapa on the Taman peninsula, Kuban Province, occurs in crusts lining cavities at the junction of the limonite and siderite-bearing schist.

**Ancylite**. Ankyllite. G. Flink, Medd. om Grönl., **14**, 235, 1899; [ibid., **24**, 49, 1901].

Orthorhombic. Axes  $\bar{a} : \bar{b} : \bar{c} = 0.916 : 1 : 0.9174$ . Forms: *d* (101), *e* (011), Angles:  $dd''' = 90^{\circ} 5'$ ,  $ee''' = 85^{\circ} 4'$ . In small rhombic pyramids, *de*, with curved faces and edges; also occasionally in small groups or druses and in crusts.

Cleavage not observed. Fracture splintery. Brittle, rather tough. H. = 4.5. G. = 3.95. Luster on crystal faces vitreous, on the fracture greasy. Color light yellow to orange, also brownish or grayish, resin-brown, yellowish green. Subtranslucent. Ax. pl.  $\parallel$  (001).  $B_{xa} \perp$  (010). Birefringence strong, optically positive.

Composition,  $4\text{Ce}(\text{OH})\text{CO}_3 \cdot 3\text{SrCO}_3 \cdot 3\text{H}_2\text{O}$ . Analysis, R. Manzelius on 0.3 gram:

$\text{CO}_2$	$\text{ThO}_2$	$\text{Ce}_2\text{O}_3$	$(\text{La}, \text{Di})_2\text{O}_3$	$\text{FeO}$	$\text{SrO}$	$\text{CaO}$	$\text{H}_2\text{O}$	insol.
23.28	0.20	22.22	24.04	0.35	21.03	1.52	6.52	0.60 = 99.76*

\* Traces of  $\text{Y}_2\text{O}_3$ ,  $\text{MnO}$ ,  $\text{F}$ .

B. B. infusible, loses  $\text{CO}_2$  and becomes brown; moistened with hydrochloric acid gives an intense red flame. In the closed tube yields water freely. Readily soluble in acids with evolution of  $\text{CO}_2$ .

Occurs at Narsarsuk, southern Greenland, with ægirite and albite; also in crusts on corroded feldspar crystals. Ancylyte is related to weibyeite (Min., p. 291).

Named from *ἀγκυλος*, curved, in allusion to the rounded character of the crystal faces.

A mineral found in a pebble in West Russia, related to ancylyte (spelled, ansilite) and parisiite, is described by G. Tschernik, Vh. Min. Ges. St. Pet., **41**, 43, 1903; Zs. Kr., **41**, 184. In minute octahedrons in part dark brown (anal. 1), in part brownish yellow (anal. 2) with rounded faces. Luster vitreous. H. = 4 - 5, dark crystals harder. G. = 4.298 dark var., = 3.962 light var. Analyses:

	$\text{CO}_2$	$\text{Ce}_2\text{O}_3$	$\text{La}_2\text{O}_3$	$\text{Pr}_2\text{O}_3$	$\text{Nd}_2\text{O}_3$	$\text{Y}_2\text{O}_3$	$\text{FeO}$	$\text{BaO}$	$\text{CaO}$	$\text{H}_2\text{O}$	insol.
1. Dark brown	23.78	44.58	2.85	2.57	tr.	5.36	tr.	13.01	6.97	—	= 99.12
2. Yellow	23.70	35.61	6.47	7.74	tr.	5.55†	tr.	12.83	6.94	0.22	= 99.06

†  $\text{MnO}$ .

ANDALUSITE, Min., p. 496; App., p. 4. — Crystals from Pisek, Bohemia; Krejčí, Ber. böhm. Ges. Wiss., xxxv, 1902; chialstolite crystals remarkable for their size and complex structure occur at Mt. Howden, ten miles north of Bimbowrie, South Australia. C. Anderson, Records Austr. Mus., **4**, 298, 1902; see also Am. J. Sc., **24**, 183, 1907.

Refractive indices; Taubert, [Inaug.-Diss., Jena, 1905]; Zs. Kr., **44**, 313.

Analyses of material from various localities in the neighborhood of Flüela and Scaletta in Switzerland, are given by A. Grammann, [Inaug.-Diss., Zürich, 1899; Viertelj. — Schrift d. Naturf. Ges. Zürich, **44**, 302, 1899]; Zs. Kr., **35**, 407. Author also discusses the probable cause of the variation in color in the Alpine specimens; Chem. constitution of; Zulkowski, Ber. Ak. Wien, **109**, (11b), 851, 1900; conversion at high temperature into *sillimanite*, which see.

ANDESINE, Min., p. 333; App., p. 4. — Crystals from Ekaluit, Greenland; Böggild, Min. Grönl., 467.

ANDORITE, App., p. 4. The following new forms were observed by Spencer, Min. Mag., **14**, 316, on crystals from Oruro:  $\omega$  (035),  $\eta$  (041),  $\xi$  (312),  $A$  (321),  $B$  (441),  $C$  (243)?,  $D$  (241),  $E$  (261). The chemical and crystallographic position is also discussed, andorite being considered as the first member of a series with diaphorite and freieslebenite.

ANGLESITE, Min., p. 907; App., p. 4. — **Crys.**: from Malfidano, Sardinia; Millesovich, Rend. Acc. Linc., **9**, (1), 153, 1900; Eureka, Utah; Rogers, Sch. Mines Q., **23**, 135, 1902; from Laurium and from the Tintic distr., Utah, the latter with several new forms; Hulyák [Term. Füz., **23**, 187, 1900] in Zs. Kr., **36**, 201; from Monte Poni, with new forms and a critical summary of all known forms with literature, etc., also a table of angles (after Gdt.); Hermann, Zs. Kr., **39**, 463, 1904; from Broken Hill, S. Australia; Toborffy, Zs. Kr., **44**, 601; from Mies., Slavík, [Abh. böhm. Akad. No. 19, 1905]; Zs. Kr., **44**, 83; from Gaeta, L. Como; Repossi, Att. Soc. Milano, **43**, 430, 1905; from ore bodies of province of Messina, Sicily; Traina, Rend. Acc. Linc., **14**, (1), 220, 1905; from Dundas, Tasmania, mine Meretrice, New Caledonia and Lewis Ponds near Orange, N. S. W. C. Anderson, Rec. Austr. Mus., **6**, 90, 1905; Zs. Kr., **43**, 621-622; from Broken Hill, N. S. W., with new forms  $Y$  (187),  $X$  (3.4.12),  $v$  (598); Anderson, Rec. Aus. Mus., **7**, 1, 63, 1908; Tintic dist., Utah; Farrington and Tillotson, Field Col. Mus., Geol. Series **3**, No. 7, p. 131, 1908. Etching figures, see under *barite*.

ANHYDRITE, Min., p. 910; App., p. 4. — Crystals from the Simplon Tunnel and the etching figures on the three cleavage faces studied by Preiswerk, Jb. Min., **1**, 33, 1905. Twin from Aussee, Styria, with new form  $p$  (151); Bascom and Goldschmidt, Am. J. Sc., **24**, 487, 1907; Zs. Kr., **44**, 65.

Effect of low temperatures upon optical properties, Panichi, [Mem. Acc. Linc., **4**, 389, 1902]; Zs. Kr., **40**, 89. Pleochroism was noted in a crystal of anhydrite from Stassfurt by Görgy, Min. Mitth., **26**, 141, 1907, giving  $\alpha$  violet,  $\beta$  colorless,  $\gamma$  violet; absorption  $\gamma > \alpha > \beta$ .

Analysis of anhydrite from Frontenac County, Ontario, by Nicol., [Can. Rec. of Sci. 1896-1897, **7**, 61], Zs. Kr., **31**, 293.

Studies in the genesis of anhydrite and its associated minerals were made by van't Hoff with Armstrong, Hiurichsen, Weigert, Farup, d'Ans; Ber. Ak. Berlin, 559, 1900; 570, 1140, 1901; 1000, 1903; 218, 1906; [Arch. Neerland d. sc. exact. et nat. Harlem, **6**, 471, 1901]; reviewed in Zs. Kr., **38**, 525; Jb. Min., **2**, 5, 1902; and by Vater, Ber. Ak. Berlin, 269, 1900.

Inclusions of liquid carbon dioxide in anhydrite from Simplon Tunnel; Spezia, Att. Acc. Torino, **39**, 521, 1904. Occurrence at Wilhelmsglück; Lenze [Ber. üb. d. Versamml. d. oberrhein. geol. Vereins, **32**, 23, 1899]; Zs. Kr., **35**, 411. In a phonolite at Hammer-Unterwiesenthal, Saxony, blue anhydrite; Bergt, Abh. naturwiss. Ges. Isis, Dresden, 88, 1899; in a micaceous dolomite from Simplon Tunnel; Spezia, Att. Acc. Sci., Torino, **38**, June, 1903.

Micro-determination in rocks; Berg, Centralbl. Min., 688, 1907.

ANKERITE, Min., p. 274. — Analysis of normal var. from Phelps Co., Mo.; Rogers, Kans. Univ. Bull., **8**, 183, 1899.

ANNABERGITE, Min., p. 818. — Artif.; de Schulten, Bull. Min. Soc., **26**, 87, 1903. Occurrence at Cobalt, Ont.; Miller, Rep. Can. Bureau Mines, **2**, 1905.

ANNERÖDITE. — See under *Uraninite*.

ANORTHITE, Min., pp. 337, 391, 1027; App., p. 5. — **Cryst.** — From Vesuvius figured by Viola, Zs. Kr., **31**, 484. From Aranyi-Berg described by V. Hulyák, [Földt. Közl., **33**, 54, 1903], Zs. Kr., **40**, 504. Following new forms given, *G* (405), *F* (205), *V* (131), *H* (421), *K* (243), *L* (243). Crystals from a volcanic bomb found on the island of St. Christopher described by Fels, Zs. Kr., **37**, 450. From Franklin, N. J., by Warren, Am. J. Sc., **11**, 369, 1901. Twins from Rochemore, Puy-de-Dôme; Vigier, Bull. Soc. Min., **31**, 142, 1908.

**Opt.** — Studies of optical constants and orientation on anorthite from Vesuvius by Becke, Ber. Ak. Wien, **108**, 434, 1899, Min. Mitth., **19**, 201, 1899; by Viola, Zs. Kr., **31**, 484, and Klein, Ber. Ak. Berlin, 346, 1899.

$$\begin{aligned} \alpha_D &= 1.57524, \text{ Viola; } 1.57556, \text{ Klein.} \\ \beta_D &= 1.58327, \quad \text{“ } 1.58348, \quad \text{“} \\ \gamma_D &= 1.58840, \quad \text{“ } 1.58849, \quad \text{“} \\ 2V &= 76^\circ 56', \quad \text{“ } 76^\circ 30', \quad \text{“} \end{aligned}$$

One of the optic axes lies in *c* (001) and makes the angle  $26\frac{1}{2}^\circ$  (Becke) with pole to *b* (010), the other optic axis makes a small angle with the *c* axis.

**Anal.** — From Phippsburg, Maine, by Hillebrand, U. S. G. S., Bull. **167**, 1900; from the island of St. Christopher by Fels, Zs. Kr., **37**, 460; from Franklin, N. J., by Warren, Am. J. Sc., **11**, 371, 1901; discussion of chemical constitution by Tschermak; Ber. Ak. Wien., **112**, (1), 355, 1903; **114**, 455, 1905; **115**, 217, 1906.

ANORTHOCLASE, Min., p. 324; App., p. 5. — Portoscuso, Sardinia, determination of refractive indices; Riva, Riv. Min. Ital., **26**, 21, 1901; Zs. Kr., **35**, 274, 1901. Anal. of phenocrysts from granite of Port Victor, S. Australia; Gartrell, [Trans. Roy. Soc. S. Aus., **27**, 256–260, 1903]; Zs. Kr., **45**, 315.

ANSILITE, see under *Ancylite*.

ANTHOPHYLLITE, Min., p. 384; App., p. 5. — Occurs with fayalite at Rockport, Mass., (Opt.) Warren, Am. J. Sc., **16**, 339, 1903, **17**, 179, 1904; also at Saint-Germain-l'Herm, France (Anal. Opt.) G. Friedel, Bull. Soc. Min., **25**, 102, 1902. Occurrence at Fonte del Prete, Elba; Cornu and Himmelbauer, [Mitth. Nat. Ver. Wien, **3**, 9–19, 1905]; Zs. Kr., **44**, 299.

Artif. formation of *kupfferite*; Allen, Wright and Clement, Am. J. Sc., **22**, 385, 1906.

**Antimon-luzonite.** *S. Stevanović*, Zs. Kr., **27**, 239, 1902. — See *Enargite*.

APATITE, Min., pp. 762, 1027; App., p. 5. — **Cryst.** — Complex crystals of rich purple color are described from Minot, Maine, by Palache, occurring with tourmaline, lepidolite, cookeite, etc., in pegmatite; optical properties (biaxial) are also described and analysis given by Wolff, Proc. Amer. Acad., **39**, 517, 1902; crystals from granite of Baveno; Artini, Rend. Acc. Linc., **11**, (2), 362, 1902; crystals, pink, also green occur at Haddam Neck, Conn.; new forms noted *l* (7430), *W* (7520), *W'* (7250); Bowman, Min. Mag., **13**, 111, 1902. Crystals described from Rautenkrantz in the Erzgebirge; Hermann, Centralbl. Min., 433, 1904; from Biella, Italy, by Zambonini with new pyramid *f* (1014), Zs. Kr., **40**, 220, 1904; from Gellivara in Norbotten, Sweden, with new forms *e* (7.0.7.11), *f* (2023) *g* (7079), *j* (7078), also refractive indices measurements; Zimányi, Zs. Kr., **39**, 505, 1904; Ann. Mus. Nat. Hung., p. 288, 1904. Needle-like crystals in volcanic bomb from Cappuccini di Albano, Italy; Viola, Zs. Kr., **37**, 370. Crystals rich in faces of a clear pale amethyst color from Gletsch, Switzerland; Busz, Centralbl. Min., 753, 1906. The following new forms noted,  $\lambda$  (4.0.4.21),  $\beta$  (5057),  $\delta$  (4045),  $\gamma$  (8089); Lyon Mt., Clinton Co., N. Y.; Whitlock, N. Y. State Mus. Bull., **107**, 72, 1907. Chemical, optical and crystallographic study of apatite from Epprechtstein, Bavaria (new forms; *B* (5490), *K* (10.9.10.0), *K*, (19.9.10.0), *D* (13.0.13.4)), and Luxullian, Cornwall. — Walter, Inaug. Diss., Univer. Münster, 1907.

**Opt.** — Refractive indices of fluorapatite from Pisek; K. Zimányi, *Zs. Kr.*, **40**, 281, 1904; *Ann. Mus. Nat. Hung.*, 562, 1904; also of crystals found in inclusions in augite andesite lava from Belbergenes near Mayen; Gaubert, *Bull. Soc. Min.*, **28**, 186, 1905. Optically anomalous crystals from amphibole diabase from Nurra, Sardinia; Viola, *Boll. Com. Geol. Ital.*, **6**, 106, 1905. Optical constants for crystals from Gletsch, Switzerland; Busz, *Centralbl. Min.*, 760, 1906. Refractive indices; Gaubert, *Bull. Soc. Min.*, **30**, 108, 1907. Optical study of material from various localities; Baumhauer, *Zs. Kr.*, **45**, 555, 1908.

**Anal.** — Gordonbrook, New South Wales, analysis; Mingaye, *Trans. Austr. Ass. Sc.*, 1898.

An apatite from Narsarsuk, Greenland, containing 3.36 p. c.  $Y_2O_3$ , has been described by G. Flink, *Medd. Grönland*, **14**, 235, 1898; **24**, 173, 1901. Analysis of crystals from Gletsch, Switzerland; Busz, *Centralbl. Min.*, 760, 1906.

Pseudomorph of "osteolite" after calcite from near Prausnitz, Kreis Jauer, Silesia; Schwantke, *Centralbl. Min.*, 641, 1905.

On the apatite deposits of Canada; A. Osann, *Geol. Surv. Canada*, **12**, Pt. O, 1899.

**Phosphorite.** — Various Swedish phosphorites contain fluorine in the same ratio to the phosphoric acid as in apatite; Andersson and Sahlbom, *Bull. G. Inst. Upsala*, **4**, 79, 1899. Occurrence in Europe; Kruff, *Jb. Min., Beil.*, **15**, 1, 1902.

**APHTHALITE**, *Min.*, p. 897; *App.*, p. 5. — See B. Gossner on the crystallographic relations of the sulphates and chromates of potassium and sodium, *Zs. Kr.*, **39**, 155, 1903; also van't Hoff on the formation of isomorphous mixtures of  $K_2SO_4$  and  $Na_2SO_4$ , *Ber. Ak. Berlin*, 359, 1903. The latter concludes that glaserite ( $K_2SO_4$ ), aphtalose or aphtalite (75%  $K_2SO_4$ ) and arcanite (62%  $K_2SO_4$ ) are probably identical.

Probable occurrence in fumaroles of Mt. Pelée, Martinique; Lacroix, *Bull. Soc. Min.*, **28**, 60, 1905. Formed at eruption of Vesuvius in 1906; see under Vesuvius.

**APOPHYLLITE**, *Min.*, p. 566; *App.*, p. 5. — **Cryst.** — Crystals with optical study and anal. from Sulitelma, Sweden; Hennig, *Geol. För. Förh.*, **21**, 391, 1899; From Seiser-Alp with (013); Zambonini, *Zs. Kr.*, **34**, 561; in tabular crystals from Rézbánya, Hungary; Zimányi, *Zs. Kr.*, **36**, 256, 1902; from Gross-Priessen, east of Aussig, showing  $t(103)$ ; Pelikan, *Ber. Ak. Wien*, **111**, 334, 1902. From Scottish localities; Goodchild, [*Trans. Geol. Soc. Glasgow*, **12**, Suppl., 1-68, 1903]; *Zs. Kr.*, **45**, 305. From following Swedish localities, Nordmarken, Taberg, Utö, Skottvång, Långbaushyttan, Hällestad; Flink, *G. För. Förh.*, **28**, 423, 1906. From basalt of East Greenland; Böggild, [*Medd. om Grönland*, **28**, 99]; *Zs. Kr.*, **43**, 636; also in *Min. Grönland*, 546, 1905. From Traversella with anal. and discussion of chem. comp.; Colomba; *Rend. Acc. Linc.*, **16**, 966, 1907.

Quartz pseudomorph after apophyllite occurs with datolite and pectolite near Fort Point, San Francisco, Cal., see under quartz.

Studies on apophyllite free from fluorine and on those which contain fluorine show that the first variety is + with higher index of refraction, the second — and with lower index of refraction; Cornu, *Centralbl. Min.*, 79, 1906.

Occurrence (with anal.) at Asmara and Seiket, Eritrea; Manasse, *Proc. Soc. Tosc.*, July, 1906. Discussion of chem. comp.; Zambonini, *Mem. Acc. Sci. Napoli*, **14**, 124, 1908. Anal. of material from Seiser Alp, Tyrol, with discussion of composition; Baschieri, *Att. Soc. Tosc.*, **24**, 1908.

Effect of ammonium chloride upon; Clarke and Steiger, *U. S. G. S., Bull.* **207**, 1902; *Zs. Kr.*, **38**, 696.

**ARAGONITE**, *Min.*, pp. 281, 1027; *App.*, p. 5. — Crystals described by Jeremejew from Karkaralinsk distr., Khirgise Steppes, *Vh. Min. Ges. St. Pet.*, [**35**, 75, 1897]; *Zs. Kr.*, **31**, 507; by Zimányi from Dognácska with new forms and list of forms for the species with references to authors, etc., *Zs. Kr.*, **31**, 353, 1899. From Herregrund, new forms, discussion of twins and measurement of refractive indices; Melezer, *Zs. Kr.*, **38**, 249, 1903; *Ber. aus Ungarn*, **23**, 272, 1905; from East Greenland; Böggild, *Medd. om Grönland*, **28**, 108, 1905; from Plauen in Vogtland; Henglein, *Centralbl. Min.*, 372, 1908.

Symmetry that of the holosymmetric class; Melezer, *Zs. Kr.*, **39**, 279, 1904. See also Beckenkamp, *Zs. Kr.*, **32**, 24, 1899.

The crystalline structure of the members of the Aragonite group has been exhaustively studied by Westhof, *Inaug. Diss.*, 1899. See also absts. in *Zs. Kr.*, **35**, 188.

Investigation of structure of mimetic crystals, Mügge, *Jb. Min., Beil. Bd.*, **14**, 247, 1901.

Fluorescence in; Schincaglia, [*Il Nuovo Cimento*, Pisa, **10**, 212, 1899]; *Zs. Kr.*, **34**, 312.

On the relations of aragonite to calcite see H. W. Foote, *Zs. phys. Ch.*, **33**, 740, 1900.

**Conchite** of Agnes Kelly, *Ber. Ak. München*, **30**, 187, 1900; *Min. Mag.*, **12**, 363, 1900, the material of molluscan shells supposed to be a new form of  $CaCO_3$  is shown by Vater, *Zs. Kr.*, **35**, 149, and Brauns, *Centralbl. Min.*, 134, 1901, to be identical with aragonite.

**Mossottite** from Montieri is shown by G. D'Achiardi; to be a mixture of calcite and aragonite, [*Att. Soc. Tosc., Proc. Verb.*, **11**, 1898]; *Zs. Kr.*, **32**, 522.

**ARAGOTITE**, *Min.*, p. 1013. — Occurrence in Ætna mercury mine, Napa Co., Calif.; Hanks, [*Jour. Roy. Microsc. Soc.*, 673, 1905]; *Zs. Kr.*, **43**, 615.

ARDENNITE, Min. p. 542. — Analysis by W. Prandtl of the arsenical variety:

SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	MnO	FeO	MgO	CaO	As <sub>2</sub> O <sub>5</sub>	V <sub>2</sub> O <sub>5</sub>	Ign.
27.77	25.25	0.53	22.70	0.65	5.20	1.44	9.91	0.81	5.24 = 99.50

This leads to the formula  $H_6Mn_3Al_5(As,V)Si_5O_{28}$ , Zs. Kr., 40, 392, 1904.

ARFVEDSONITE, Min., p. 401; App., p. 6. — Crystals from Narsarsuk, Greenland; Flink, Medd. Grönl., 24, 77, 1901.

ARGENTITE, Min., p. 46. — Occurrence at Cobalt, Ontario; Miller, Rep. Can. Bureau of Mines, 14, Pt. 2, 1905. Occurrence (with anal.) at California mine on Glacier Mt., Montezuma, Summit Co., Colo.; Van Horn, Am. J. Sc., 25, 508, 1908.

ARGENTODOMEYKITE, see under *Domeykite*.

ARGENTOPERCYLITE, Chem. Zeit., 16, 1952, 1892, same as *Boleite*, which see.

ARGYRODITE, Min., p. 150; App., p. 6. — Occurrence in Bolivia; Canfield, Am. J. Sc., 23, 20, 1907. Crystallographic and chemical study of material from Colquechaca, Bolivia; V. M. Goldschmidt, Zs. Kr., 45, 548, 1908. Anal. of material from old specimen from "Bescheert Glück" mine, Freiberg; Kolbeck, Centralblt. Min., 331, 1908.

See *Plusinglanz*.

ARSENIC, Min., p. 11; App., p. 6. — Occurs near Montreal with calcite in a vein cutting nephelitesyenite, G. = 5.74, contains 1.65 Sb and 0.16 S; Evans, Am. J. Sc., 15, 92, 1903. Also occurs in reniform masses at Washington Camp, Santa Cruz Co., Arizona; Warren, Am. J. Sc., 16, 337, 1903.

ARSENOPYRITE, Min., p. 97; App., p. 6. — Crystals from the Lengenbach quarry in the Binnenthal have been measured by Lewis, Min. Mag., 13, 291, 1903. Crystals from Brosso and Traversella with new form (221): Colomba, Rend. Acc. Linc., 15, 642, 1906. Crystals from Ivigtut, Greenland; Böggild, Min. Groenland, 49, 1905.

The cobaltiferous variety, danaite, from the Sulitjelma mines in northern Norway, contains 1.15 p. c. Co and gives an axial ratio near that of glaucodot, according to Fletcher, Min. Mag., 14, 54, 1904. Crystals from the same locality earlier described by Stelzner gave 6.81 p. c. Co, cf. Fletcher, l. c., also Vogt, Zs. prakt. Geol., 2, 43, 1894, and Hintze, Min., 1, 863, 1901.

Occurrence (with anal.) at Cobalt, Ont.; Miller, Rep. Can. Bureau Mines, 14, Pt. 2, 1905.

ARSSENSCHWEFEL, *E. Monaco*, [Ann. Scuola Agricolt. Portici, 1902], Zs. Kr., 40, 297, 1904.

A blue-gray mineral with metallic luster occurring in granular crystalline (tetragonal ?) aggregates, mixed with realgar, at the Solfatara of Pozzuoli, near Naples. An analysis, yielding the formula  $As_2S_3 + H_2O$ , gave: S, 35.92; As, 56.90;  $H_2O$ , 7.00 = 99.82.

ARSENSULFURITE, see *Sulphur*.

Artinite. *L. Brugnatelli*, [Rend. R. Ist. Lomb. Mailand, 35, 869, 1902; 36, 824, 1903]; Centralblt. Min., 144, 663, 1903; Zs. Kr., 40, 103; 41, 257.

Orthorhombic. Fibrous, radiating, in spherical aggregates.

H. = 2. G. = 2.028. Color white. Optically —. Length of fibres usually  $\parallel b$ . Ax. pl. usually  $\perp$  to length of fibres.  $\beta$  = about 1.537.  $\gamma - \alpha$  = about 0.055. 2E over  $90^\circ$ .

Comp. —  $MgCO_3 \cdot Mg(OH)_2 \cdot 3H_2O = MgO, 40.82; CO_2, 22.45; H_2O, 36.73$ .

Anal. on material from Val Laterna:

MgO	CO <sub>2</sub>	H <sub>2</sub> O
41.34	22.37	(36.39) = 100.00

Obs. Found in an asbestos quarry associated with a peridotite at Val Brutta in the Val Laterna. Later observed with magnesite at Èmarede in the Aosta valley. Named in honor of Prof. Ettore Artini of Mailand.

Arzrunite. *A. Arzruni* and *K. Thaddeeff*, Zs. Kr., 31, 230, 1899.

Orthorhombic. In druses of small hexagonal prisms with basal planes and minute pyramidal faces; these are interpreted as being orthorhombic with a prismatic angle sensibly  $60^\circ$ , and showing the forms  $b$  (010),  $c$  (001),  $m$  (110), also (021) and (111). Color blue or bluish green, but the light transmitted through the prism is in part blue, in part nearly colorless. Biaxial, an axis nearly  $\perp m$ .

Composition highly uncertain, as the material for analysis was scanty (0.2, 0.19 gr.) and very impure; further the only completed analysis shows a loss of 2 p. c.

Analyses, Thaddeeff:

SO <sub>2</sub>	Cl	PbO	CuO	H <sub>2</sub> O	Fe <sub>2</sub> O <sub>3</sub>	CaO	ZnO	SiO <sub>2</sub>
1. 8.07	14.39	31.41	21.39	undet.	0.70	1.70	undet.	13.60
2. 13.06	9.46	33.38	14.54	11.01	1.81	1.87	4.08	8.88 = 98.09

Of the above the  $\text{SiO}_2$  is assumed to be present as quartz,  $\text{Fe}_2\text{O}_3$  as limonite,  $\text{ZnO}$  as goslarite, furthermore the mineral graduates into lanarkite; deducting the impurities a formula is deduced which would make arzrunite a double salt of basic lead sulphate and a basic copper chloride,  $(\text{Pb}_2\text{O})\text{SO}_4 \cdot 3(\text{CuCl}_2 \cdot \text{H}_2\text{O}) \cdot \text{Cu}(\text{OH})_2$ ; the result, however, has little value.

Observed as a drusy crystalline incrustation lining cavities in the cellular gangue rock at the mine Buena Esperanza, Challacollo, Tarapaca, Chile. Named after Prof. A. Arzruni of Aachen.

**ASBESTUS.** — Occurrence, Exploitation and Uses is the title of a pamphlet (pp. 169, 19 plates) by Fritz Cirkel, published at Ottawa in 1905 by the Mines Branch of the Dept. of the Interior, Canada. It gives an account of the amphibole asbestos occurring in Hastings Co., Ontario, and elsewhere, which has, however, only limited applications in the arts; also, more fully of the serpentine asbestos, or chrysotile, mined extensively in Canada, particularly south of Quebec at Thetford, etc.

The occurrence and origin of asbestos (chrysotile) is discussed at length in the geological reports of Vermont for 1903-1904 and for 1905.

**ASCHARITE**, App., p. 6. — Formation discussed; van't Hoff, Ber. Ak. Berlin, 652, 1907.

**ASPHALT**, etc., Min., pp. 1017-1020. — The asphalt and bituminous rock deposits of the United States, with description, occurrence, etc., of asphaltum, albertite, impsomite, grahamite, nigrite, uintahite (gilsonite), wurtzilite, ozocerite; Eldridge, 22nd Ann. Rep. U. S. G. S., 1, 211-452, 1900-1901.

**ASTRAKAMITE**, Min., p. 946. — See *Blödite*.

**Astrolite.** Astrolith, *R. Reinisch*, Centralbl. Min., 108, 1904.

Orthorhombic (?). In globular forms with radiated or stellate structure. Under the microscope foliae are noted, in part showing sections of irregular outline without cleavage lines and non-pleochroic, to these  $\text{Bx}_2(-)$  is normal with  $2E = 48^\circ$ , dispersion  $\rho > v$ ; sections of foliae are also in part elongated, pleochroic, and showing cleavage cracks.

$H. = 3.5$ .  $G. = 2.78$ . Luster vitreous to pearly. Color siskin-green. Streak grayish white. Translucent.

Composition somewhat uncertain, the material being impure from inclusions; the formula deduced is that of a metasilicate:  $(\text{Na}, \text{K})_2\text{Fe}(\text{Al}, \text{Fe})_2(\text{SiO}_3)_6 \cdot \text{H}_2\text{O}$ . Analysis, after deducting 3.88 p. c.  $\text{CaCO}_3$ :

$\text{SiO}_2$	$\text{Al}_2\text{O}_3$	$\text{Fe}_2\text{O}_3$	$\text{FeO}$	$\text{K}_2\text{O}$	$\text{Na}_2\text{O}$	$\text{H}_2\text{O}$
52.14	8.15	13.05	12.01	5.20	6.62	2.83 = 100

Fuses B. B. at 3.5 quietly to a gray enamel; reacts for iron with the fluxes; not sensibly attacked by acids.

Occurs inclosed in a diabase tuff near Neumark in masses of black siliceous schist, of granular limestone and of calcareous alum schist in Saxon Voigtland. Named in allusion to the stellated structure.

**ASTROPHYLLITE**, Min., p. 719. — From Narsarsuk, Greenland; Böggild, Medd. om Grönl., 33, 103, 1906.

**ATACAMITE**, Min., p. 172; App., p. 6. — Cryst. From the Brilladora mine, Paposo, Atacama, show the new forms  $\beta$  (210),  $\gamma$  (150); Moses, Am. J. Sc., 12, 100, 1901; from same locality; Keller, Proc. Amer. Phil. Soc., 47, 84, 1908; from Sardinia; Pelloux, Att. Acc. Linc., 13, (2), 34, 1904; from Bimbowrie, S. Australia, with anal.; Mawson, [Trans. Roy. Soc. S. Aus., 30, 67-70, 1906]; Zs. Kr., 45, 315; from Gloncurry, Queensland; Anderson, Rec. Aus. Mus., 7, (1), 67, 1908.

**ATOPITE**, Min., p. 861. — Occurs at the manganese mines of Miguel Burnier, Minas Geraes, Brazil, (anal.); Hussak, Centralbl. Min., 240, 1905.

**AUERBACHITE**, see under *Zircon*.

**AUGELITE**, Min., p. 847; App., p. 6. — Found in small amount in the silver ores of Tatasi and Portugalete, in the province Sud-Chichas, Potosi, and from Oruro, Bolivia. New face  $g$  (910) observed. Indices of refraction for Na light = 1.5752 and 1.5893.  $2E = 82\frac{1}{2}^\circ$ .  $G. = 2.69$ . Spencer, Min. Mag., 12, 1; *ibid.*, 14, 323.

**AUTUNITE**, Min., p. 857. — Study of absorption spectrum and the changes through loss of water by heating into "metakaluranite;" Rinne, Centralbl. Min., 709, 1901.

Occ. in Madagascar and at Tinh-Tuc, region of Cao-Bang, Tongking, China; Lacroix, Bull. Soc. Min., 31, 245, 259, 1908.

**AWARUITE**, Min., pp. 29, 1043. — Native nickel-iron alloys, near the awaruite from New Zealand, have been described by Sella from Biella, Piedmont, see Min., p. 1043; also by Melville from Josephine Co., Oregon, and called *josephinite*, see App., p. 38; by Hoffmann from the auriferous gravels of the Fraser river, British Columbia, and called by him *souesite*, Am. J. Sc., **19**, 319, 1905; by Jamieson from Josephine Co., Oregon (see above) and from South Fork, Smith river, Del Norte Co., California, *ibid.*, **19**, 413, 1905.

The alloy called *souesite* (after Mr. F. Soues) is obtained from the gold washings of the Fraser river near Lillooet, with platinum, iridosmine, magnetite, chromite, etc. It occurs in small, irregular, rounded grains, not exceeding 1.5 mm. in diameter, in part microscopic. Strongly magnetic and malleable.  $G = 8.215$ . Slowly dissolved in hot hydrochloric acid, readily in hot nitric acid. Analysis 1 below by Wait, after deducting 1.16 p. c. silica.

The nickel-iron from Oregon (earlier described by Melville, and named *josephinite*, Am. J. Sc., **43**, 509, 1892, App., p. 38) occurs in water-worn, bean-shaped pebbles, from a few millimeters to several centimeters in diameter; these consist of a sponge-like mass enclosing particles of a silicate resembling serpentine; analysis, 2 below, after deducting impurities.

The Smith river iron is in nearly uniform grains, from 0.15 to 1.5 mm. in diameter; it is obtained with magnetite and chromite as a residue from gold washings.  $G = 7.85$  (corrected for admixed magnetite).

Analyses: 1. Wait, l. c.; 2, 3. Jamieson, l. c.

	Ni	Fe	Co	Cu	P	S
1. Fraser R., <i>souesite</i>	76.48	22.30	....	1.22	....	.... = 100
2. Josephine Co., Oregon	74.23	25.18	0.46	....	0.04	0.09 = 100
3. Smith R., California	76.69	21.37	1.20	0.64	0.04	0.06 = 100

The above approximate to  $Ni_3Fe$  which requires Ni 76.0, Fe 24.0 = 100. Skey obtained for awaruite Ni 67.63 and Mattirolla for the Biella mineral described by Sella Ni(Co) 75.20.

**AXINITE**, Min., p. 527; App., p. 7. — Crystals from Obira, Japan, described by Zimányi, Zs. Kr., **32**, 125, 245, 1899; also by Ford, Am. J. Sc., **15**, 200, 1903, and by Wada, Minerals of Japan, p. 114, Tokyo, 1904; crystals from Biella, Italy; Zambonini, Zs. Kr., **40**, 259, 1904; from Bowling Alley Point, near Mundle, N. S. W.; from Moonbi, N. S. W., and from Colebrook mine, Dundas, Tasmania; Anderson, Rec. Aus. Mus., **6**, 133-137, 1906; from Tremore, Bodmin, Cornwall; Barrow and Thomas, Min. Mag., **15**, 119, 1908.

Ford (l. c.) gives the analyses 1 and 2 below, from which, and with other reliable earlier analyses, the formula  $R_2^{II}R_4^{III}B_2(SiO_4)_8$  is deduced; here  $R^{II} = Ca$  chiefly, also Fe, Mn, Mg, H<sub>2</sub> and  $R^{III} = Al$ , also Fe.

	G	SiO <sub>2</sub>	B <sub>2</sub> O <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	FeO	MnO	CaO	MgO	H <sub>2</sub> O
1. Bourg d'Oisans	3.287	42.78	6.12	17.67	0.99	6.02	2.99	20.16	2.41	1.40 = 100.54
2. Obira, Japan	3.028	41.80	5.61	17.15	1.11	2.84	10.71	19.51	0.21	1.22 = 100.16
3. Bonsall, San Diego Co., Calif.		42.61	6.04	17.43	0.38	7.53	4.10	19.74	0.44	1.56 = 99.83
4. Consumers Mine, Amador Co., Calif.		42.79	[6.70]	16.38	....	4.22	8.76	19.21	0.09	1.85 = 100.00

Anal. 3 and 4 by Schaller (priv. contr.), who finds that axinite consists of isomorphous mixtures of ferroaxinite,  $8SiO_2$ ,  $2Al_2O_3$ ,  $2FeO$ ,  $H_2O$ ,  $4CaO$ ,  $B_2O_3$ , and manganoaxinite,  $8SiO_2$ ,  $2Al_2O_3$ ,  $2MnO$ ,  $H_2O$ ,  $4CaO$ ,  $B_2O_3$ .

**AZURITE**, Min., p. 295; App., p. 7. — Crystals from Rosas, Sardinia; Riva, Zs. Kr., **31**, 534, 1899; from Chessy with new forms (261), (I.10.2), also crystal from Broken Hill; Cesàro, Bull. Ac. Belg., 130-143, 1905.

Occurrence at Castello di Bonvei, near Mara, Sardinia; Millosevich, Rend. Acc. Linc., **15**, (2), 732, 1906; from Timpono Rosso, near Lagonegro, Basilicata; Zambonini, *ibid.*, **16**, (2), 737, 1907.

**BABINGTONITE**, Min., pp. 381, 1027; App., p. 7. — Palache and Fraprie have described crystals from Somerville and Athol, Mass., Proc. Amer. Acad., **38**, 382, 1902. At Somerville it occurs with prehnite in veins and pockets in diabase, the crystals are complex and show several new forms. An analysis by Fraprie gave:

SiO <sub>2</sub>	TiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	FeO	MnO	CaO	MgO	(Na,K) <sub>2</sub> O	H <sub>2</sub> O
52.25	0.18	5.27	7.49	11.05	1.94	20.36	0.46	0.22	0.29 = 99.51

Shepard's identification of babingtonite at Athol is confirmed. The crystals are less complex than those from Somerville.

**BADDELEYITE**, App., p. 8. — Three crystals found in the gem gravels from Balangoda, Ceylon. The axial ratio calculated from measurements on these crystals was  $\tilde{a} : \tilde{b} : \tilde{c} = 0.9905 : 1 : 0.5110$ ;  $\beta = 80^\circ 32'$ . Anal. 1. Blake and Spencer, Min. Mag., **14**, 378.

Occurs in rolled masses in the Rio Verdinho near Caldas, Minas Geraes, Brazil; E. Hussak, *Min. petr. Mitth.*, **18**, 339, 1899; Hussak and Reitingger, *Zs. Kr.*, **37**, 566, 1903, have described other occurrences of "zirkonfavas" from the same region, including light brown specimens with  $G. = 4.639-4.983$  (anal. 2) and slate-gray to blackish,  $G. = 5.102-5.402$  (anal. 3). These "zirkonfavas" are probably alteration products of silicates containing zirconium.

The same authors also describe "zirkonoxydfavas" occurring in reniform crusts, fibrous and concentric; they contain 97.19 p. c.  $ZrO_2$  and are regarded as an independent modification of the native  $ZrO_2$ , not as fibrous baddeleyite.

		ZrO <sub>2</sub>	SiO <sub>2</sub>	TiO <sub>2</sub>	Fe <sub>2</sub> O <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub>	CaO	Ign.
1. Crystals, Ceylon	$G. = 5.72-5.82$	98.90	0.19	...	0.82*	...	0.06	0.28 = 100.25
2. Light brown, Brazil	$G. = 4.85$	81.75	15.49	0.50	1.06	0.85	<i>tr.</i> MnO	0.63 = 100.28
3. Slate-gray, Brazil	$G. = 5.245$	93.18	1.94	0.61	2.76	0.64	....	0.47 = 99.60

\* Including FeO.

**Badenite.** *P. Poni*, *Min. Roumanie*, p. 17, 1900 (*Ann. Sci. Univ. Jassy*, **1**, 29). — Massive granular to fibrous.  $G. = 7.104$ . Luster metallic. Color steel-gray, becoming dull on exposure to the air.

Composition,  $(Co, Ni, Fe)_2(As, Bi)_3$ .

Analysis:	As	Bi	S	Co	Ni	Fe
	61.54	4.76	0.27	20.56	7.39	5.98 = 100.50

B. B. on charcoal gives arsenical fumes and fuses to a magnetic bead; with borax a cobalt bead. In the closed tube yields metallic arsenic and in the open tubes a crystalline sublimate of  $As_2O_3$ . Dissolves easily in nitric acid.

From Roumania, occurring in the valley of Neguletzul, opposite the village Badeni-Ungureni, district of Muscel; associated with erythrite, annabergite, malachite in siderite.

**Bakerite.** *W. B. Giles*, *Min. Mag.*, **13**, 353, 1903.

In compact masses resembling unglazed porcelain; under the microscope feebly birefringent.  $H. = 4.5$ .  $G. = 2.73$ ; 2.7-2.93, Spencer. Color white with sometimes a faint tinge of sea-green.

In composition a hydrated calcium borosilicate. Analyses yield the formula  $8CaO.5B_2O_3.6SiO_2.6H_2O$ .

	SiO <sub>2</sub>	B <sub>2</sub> O <sub>3</sub>	CaO	H <sub>2</sub> O	Al <sub>2</sub> O <sub>3</sub> , Fe <sub>2</sub> O <sub>3</sub>
White	28.45	27.74	34.88	8.30	0.63 = 100
Faint greenish	28.05	26.85	35.22	8.60	1.22 = 100

Fuses B. B. to a white transparent bead, coloring the flame green. Readily soluble in dilute hydrochloric acid, the solution on evaporation yielding gelatinous silica.

Occurs in veins and nodules in the mines of the Consolidated Borax Company situated in the Mohave desert, sixteen miles N. E. of Daggett in San Bernardino Co., Cal. Named after Mr. R. C. Baker of Nutfield, Surrey, director in the Borax company, who discovered the mineral.

**BARITE**, *Min.*, pp. 889, 1027; *App.*, p. 8. — **Cryst.** — From Tetschen.-Bodenbach, Bohemia, with *K* (267); Polak, [*Lotos*, **77**, 1897], *Zs. Kr.*, **31**, 528; from Auvergne, with (11.3.8); Buttgenbach, *Ann. Soc. G. Belg.*, **25**, xxx, 1898; Is. San Pietro, Sardinia, with (152); Millosevich, *Rend. Acc. Linc.*, **9**, (1), 336, 1900; Sarrabus, Sardinia; D'Achiardi, *Mem. Soc. Tosc.*, **17**, 1900; Caserta province, Italy, refractive indices measured; P. Franco, [*Boll. Soc. G. Ital.*, **19**, 1900], *Zs. Kr.*, **35**, 523; Bölet, Sweden; Edgren, *G. För. Förh.*, **23**, 322, 1901; complex crystals from limestone, Kansas City, Mo.; Rogers, *Am. J. Sc.*, **12**, 47, 1901; Pitkärinta, Sweden; Borgström, *Geol. För. Förh.*, **23**, 557, 1902; Basin, Montana; Rogers, *Sch. Mines Q.*, **23**, 135, 1902; Siliceous barites; Delkeskamp, *Zs. für Naturwiss.*, Halle, **75**, 185, 1902; crystals from various Bohemian localities; Prehlik, *Ber. böhm. Ges. Wiss.*, xlvii, 1902; Sassina Valley, with (253), (7.16.10); Artini, *Att. Soc. Milano*, **42**, 102, 1903; from Russian localities with new forms in part uncertain; J. Samojloff, *Vh. Min. Ges. St. Pet.*, **38**, 323, 1900, and *Zs. Kr.*, **36**, 172, 1901; also by the same author a critical summary of known forms, with several new ones, *Bull. Soc. Mosc.*, **16**, 105, 1902, and *Zs. Kr.*, **39**, 614, 1904; from Lozère, France; Guédras; *C. R.* **138**, 1440, 1904; Undscha river near Polowtschinowo, Kostroma, Russia, with form (214)(?); Artemieff, *Bull. Soc. Nat. Moscow*, 364, 1904; *Zs. Kr.*, **43**, 73; various types of crystals from Mies, Bohemia, with following new forms: (253), (1.12.11), (045), (067), (054), (199), (164), (168), (179), (169), (188), (1.16.16), (1.16.24), (1.16.32); Slavik, [*Abh. böhm. Akad. No. 19*, 1905]; *Zs. Kr.*, **44**, 80; Rákó, Abanj.-Torna, Hungary; Zimányi, *Földt. Közl.*, **35**, 547, 1905; from sandstone of Calafuria, Tuscany; Manasse, *Att. Soc. Tosc. Sci. Nat.*, Pisa, **21**, 159, 1905; from localities near Sydney, N. S. W.; C. Anderson, *Rec. Austr. Mus.*, **6**, 89, 1905; sand-barite crystals from Oklahoma; Nichols, *Field Columbian Mus.*, No. 111; Traversella with new forms,  $\Pi_1$  (350);  $E_1$  (170);  $E_2$  (1.10.0);  $e_2$  (1.1.14);  $e_1$  (1.1.17);  $\delta_1$  (727); from Brosso; Colomba, *Rend. Acc. Linc.*, **15**, 419, 1906; Tschiaturi, Caucasus; Surgunoff, *Bull. Nat. Moscow*, p. 153, 1906; Simferopol, Crimea, with new form (027); Fersmann, *ibid.*, p. 201, 1906; acicular crystals from marble of



Carrara; D'Achiardi, Proc. Soc. Sc. Tosc., Mar. 11, 1906; Frostburg, Maryland, with Y (551); Schaller, Am. J. Sc., 21, 364, 1906; Dernö and Alsósajó, Comitat Gömör, Hungary, with new forms, (047), (407); Zimányi, Zs. Kr., 44, 162, 1907; Wellington, N. S. W.; Anderson, Rec. Aus. Mus., 6, 413, 1907; Pine Hill mine, Nevada Co., Calif.; Eakle, Uni. Calif. Pub., 5, 6, 90, 1907; in peat at Sillweg, Styria; Cornu, Centralbl. Min., 280, 1908; Binnenthal, Switzerland; Baumhauer and Trechmann, Zs. Kr., 44, 609, 1908; from Norwegian localities; Traag, with description of etched faces; Fehn, with new form  $\psi$  (15.5.12); Kongsberg, with new forms, W, (2.0.13), and  $\kappa$ , (5.0.13); Heskestad; Arendal and Alten; with discussion of variation in axial ratios; T. Vogt; Norsk Geol. Tidsskrift, 1, 9, 1908; Khargeh, Egypt; Couyat, Bull. Soc. Min., 31, 268, 1908; Framont, Bergheim, Brézouard, Steinbach, Mine de Saint-Sylvestre near Urbeis, all in Alsace; from Lubine (new form (7.0.20)), Flaviac and Cassagnoles in France; Liskeard, Cornwall; Montevocchio, Sardinia; Los Tocayos, Sombrerete and Tepatitlan, Mexico, Apishapa, Colorado (new forms, (083), (887), (342)); Ungemach, Bull. Soc. Min., 31, 192, 1908; Boccheggiano, Grosseto, Italy; Viola, Rend. Acc. Linc., 17, 1, 496, 1908; Besano, Italy; Repossi, Att. Soc. Milano, 47, 93, 1908; Cartersville, Georgia; Farrington and Tillotson, Field Col. Mus., Geol. Series, 3, No. 7, 134, 1908.

Etching figures compared with those on celestite and anglesite; Samojloff, Zs. Kr., 45, 113; natural etching figures, see Sommerfeldt, Centralbl. Min., 97, 1902.

Presence of lamellæ in crystals from Rosenhof near Clausthal, Prussia; Andréé, Centralbl. Min., 230, 1908.

Fluorescence; Schineaglia, [Il Nuovo Cimento, Pisa, 10, 212, 1899]; Zs. Kr., 34, 312; Pleochroism in barite from Teplitz, Bohemia; Cornu, Centralbl. Min., 468, 1907; *ibid.*, 393, 1908; see also Cesàro, Bull. Ac. Belg., 330, 1907.

On the dielectric constant; Fellingner, Zs. Kr., 35, 187, 1901.

Artificial formation; de Schulten, Bull. Soc. Min., 26, 103, 1903.

BARYLITE, Min., p. 562. — M. Weibull, G. För. Förh., 22, 33, 1900, has extended the examination of Blomstrand (1874) as follows: Crystallization orthorhombic; axes  $\tilde{a} : \tilde{b} = 0.4084 : 1$ . Crystals imperfect, tabular  $\parallel a$  but showing no other faces; cleavage  $a$  good, also  $b$ ,  $c$ , and  $m$ , cleavage angle  $am = 22^\circ 13'$  ( $22^\circ 6' - 22^\circ 21'$ ),  $mm''' = 44^\circ 26'$ . Color milk-white. Optically +. Ax. pl.  $\parallel c$ ,  $Bx_a \perp a$ . Dispersion  $\rho > \nu$  small.  $2V_{Na} = 65^\circ$ .  $\beta_{Na} = 1.685$ ,  $\gamma - \alpha = 0.014$ . A relation to the chrysolite group (*knebelite*) as well as iolite is suggested.

BARYSILITE, Min., p. 421. — Occurs at Långban, Sweden, as described by Hj. Sjögren, G. För. Förh., 27, 458, 1905. Crystals rhombohedral, tabular in habit, with the forms  $c$  (0001),  $s$  (10 $\bar{1}$ 1),  $r$  (9097),  $n$  (2794);  $cs = 29^\circ 19'$ ;  $ss' = 129^\circ 51'$ ;  $rr' = 119^\circ 4'$ ;  $\tilde{c} = 0.4863$ , G. Flink. G. = 6.72 (corrected). Optically uniaxial. Analysis by R. Mauzelius:

SiO <sub>2</sub>	PbO	FeO	MnO	MgO	CaO	Na <sub>2</sub> O	H <sub>2</sub> O(100°)	Cl	
16.42	79.51	0.04	3.34	0.03	0.60	0.08	0.02		tr. = 100.04

Discussion of chem. comp.; Cesàro, Mem. Soc. Liège, 5, No. 6, 16, 1904.

BARYTA-ORTHOCLASE, see under *Celsian*.

Baumhauerite. R. H. Solly, Min. Mag., 13, 151, 339; Zs. Kr., 37, 321; 38, 652. Monoclinic.  $\tilde{a} : \tilde{b} : \tilde{c} = 1.1368 : 1 : 0.9471$ .  $\beta = 82^\circ 42' 45''$ . Forms:  $a$  (100),  $b$  (010),  $c$  (001), (702), (301), (502), (201), (302), (101), (102), (103), (104), (106), (30 $\bar{1}$ ), (50 $\bar{2}$ ), (20 $\bar{1}$ ), (704), (30 $\bar{2}$ ), (10 $\bar{1}$ ), (10 $\bar{2}$ ), (104), (120), (110), (320), (210), (520), (111), (11 $\bar{1}$ ), (122), (12 $\bar{2}$ ), (011). These are the most common forms observed, there being one hundred and twenty forms listed in the original articles.

Angles:  $100 \wedge 101 = 50^\circ 27'$ ,  $101 \wedge 001 = 32^\circ 15\frac{3}{4}'$ ,  $010 \wedge 11\bar{1} = 50^\circ 33'$ ,  $010 \wedge 111 = 53^\circ 51\frac{1}{2}'$ .

Crystal habit varied, (1) with large development of (010), (2) tabular  $\parallel$  (100), (3) prismatic  $\parallel \tilde{a}$  axis, (4) with rhombic shape.

Cleavage:  $a$  perfect. Fracture conchoidal. H. = 3. G. = 5.330. Luster metallic. Color lead to steel-grey, with sometimes an iridescent tarnish.

Composition,  $4PbS.3As_2S_3 =$  sulphur 24.61, arsenic 26.64, lead 48.75.

Anal. by Jackson:

S	As	Pb
24.39	26.42	48.86 = 99.67

Obs. — from the Binnenthal in Switzerland.

Named in honor of Prof. H. Baumhauer, of Freiburg.

BAUXITE, Min., p. 251; App., p. 9. — Analyses of bauxite from Adairsville, Ga., which correspond to  $Al_2O_3.3H_2O$ . Watson, Amer. Geol., 28, 25, 1901; Zs. Kr., 37, 79; from Italian localities; Formenti, (Gazz. chim. ital., 31, 455, 1901; 32, 453, 1902), Zs. Kr., 37, 406, 40, 109; Aichino; D'Achiardi, Lotti, (Rass. Min., 15, 1902, 18, 1903), Zs. Kr., 40, 296, 41, 261, 279; Novarese, Zs. prakt. Geol., 11, 299, 1903.

Occ. Does not occur at Calabre as stated in Sys., p. 251; Salmoiraghi, Rend. Inst. Lomb. Milano, 33, 252, 1900.

**Bavenite.** *E. Artini*, Acc. Linc., 10, (2), 139, 1901.

Monoclinic. Axes  $a : b : c = 1.1751 : 1 : 0.7845$ ;  $\beta = 89^\circ 17' 19''$ . Forms:  $a$  (100),  $m$  (110),  $g$  (210), (103), (101).

In fibrous-radiated groups of pseudo-orthorhombic prismatic crystals, flattened parallel  $a$  (100). Faces  $a$  striated  $\parallel$  edge  $a/c$ .

Cleavage  $b$  easy.  $H. = 5.5$ .  $G. = 2.72$ . Color white. Ax. pl. nearly normal ( $2^\circ$ ) to  $a$ .  $Bx_a \perp$  cleavage ( $b$ ).  $2E\gamma = 78^\circ 30'$ ,  $\beta = 1.580$ .

Composition,  $Ca_3Al_2Si_6O_{18} \cdot H_2O$ .

Analysis:	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	CaO	MgO	Na <sub>2</sub> O	H <sub>2</sub> O
	56.93	15.42	24.47	0.12	0.29	2.49 = 99.72

Occurs in pegmatitic druses in the granite of Baveno, Italy.

**BECHILITE**, Min., p. 888. — Occ. in Argentina of var. *hayesine* which author considers as identical with bechilite; Buttgenbach, Am. Soc. géol. Belg., 28, 99, 1900–1901.

Formation discussed; van't Hoff, Ber. Ak. Berlin 652, 1907.

**Beckelite.** *J. Morozewicz*, Min. Mitth., 24, 120, 1905; Bull. Inter. de l'Acad. des Sci. de Cracovie, 485, 1905.

Isometric. Observed forms:  $a$  (110),  $o$  (111),  $d$  (110). In small crystals, often microscopic, the smaller crystals showing combinations of cube and octahedron, the larger being dodecahedral.

Cleavage cubical. Fracture conchoidal.  $H. = 5$ .  $G. = 4.15$ . Luster nonmetallic. Color yellow.

Composition,  $Ca_3(Ce,La,Di)_4Si_3O_{15}$ . The analysis gave:

SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	ZrO <sub>2</sub>	Y <sub>2</sub> O <sub>3</sub>	Er <sub>2</sub> O <sub>3</sub>	Ce <sub>2</sub> O <sub>3</sub>	La <sub>2</sub> O <sub>3</sub>	Di <sub>2</sub> O <sub>3</sub>	Mn <sub>2</sub> O <sub>3</sub>	CaO	MgO	K <sub>2</sub> O	Na <sub>2</sub> O	Ig.
17.13	0.30	tr.	2.50	2.80		28.10	13.60	18.00	0.07	15.46	tr.	0.39	0.78	0.99 = 100.12

Infus. Sol. in phosphorus salt, giving a pale yellow-green bead that is not changed in the reducing flame. Easily sol. in acids.

Occurs in connection with nepheline syenite rocks near Mariupol, on the north shore of the Sea of Azov, Russia, and is associated with nepheline and magnetite.

Named after F. Becke.

**Beckerite.** *E. Pieszczyk*, [Arch. Pharm. (3), 14, 433, J. Ch. Soc., Abstracts, 40, 687, 1881]. Spencer, Min. Mag., 12, 379, 1900. — A brown resin occurring with Prussian amber.

**Belith.** — See *Alith*.

**Bellite.** *W. F. Petterd*, Notes on Tasmanian Minerals, priv. publ., John Vail, Gov't printer, Tasmania, 1904.

Hexagonal. In aggregates of delicate tufts and in thin velvety coatings, rarely showing minute acicular crystals; sometimes pulverulent.

$H. = 2.5$ .  $G. = 5.5$ . Luster adamantine. Color bright crimson-red in the mass, also yellow to orange especially when distinctly crystallized. Streak pale yellow. Transparent to translucent.

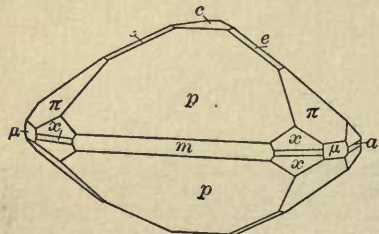
In composition lead chromate containing arsenious oxide, etc.

An analysis by J. D. Millen gave:

CrO <sub>3</sub>	As <sub>2</sub> O <sub>3</sub>	PbO	V <sub>2</sub> O <sub>5</sub>	P <sub>2</sub> O <sub>5</sub>	Al <sub>2</sub> O <sub>3</sub>	Cl <sup>-</sup>	SO <sub>3</sub>	SiO <sub>2</sub>
22.61	6.55	61.68	0.11	0.04	0.01	0.52	0.05	7.59 = 99.16

B. B. fuses readily, yielding a lead globule with lead and arsenic coatings and arsenical odor; reacts for chromium with salt of phosphorus.

From the upper workings of the Magnet silver mine, Magnet, Tasmania, associated with a chromiferous cerussite, also with crocoite and mimetite; forms a lining to druses of a soft iron-manganese gossan. Named after Mr. W. R. Bell of Tasmania.



Benitoite (Palache)

$\omega = 1.77$ ;  $\epsilon = 1.80$ . Absorption  $\epsilon > \omega$ .

**Benitoite.** *G. D. Louderback*, Uni. Cal. Pub., 5, 9, 149, 1907; Rogers, Science, 28, 676, 1908; Palache, Am. J. Sc., 27, 398, 1909.

Hexagonal, ditrigonal-bipyramidal.  $c = 0.7319$  (Palache). Forms:  $m$  (1010),  $\mu$  (0110),  $a$  (1120),  $c$  (0001),  $p$  (1011),  $\pi$  (0111),  $e$  (0112),  $x$  (2241). Angle: (0001) : (1011) =  $40^\circ 12'$ . In crystals with  $p$  prominent. Occasionally tabular.

Cleavage  $\parallel p$ , imperfect; fracture conchoidal.  $H. = 6.25$ – $6.5$ .  $G. = 3.64$ – $3.65$ . Color sapphire blue to light blue and colorless. Transparent. Strongly dichroic,  $\epsilon =$  deep blue,  $\omega =$  colorless. Refractive indices,

Comp. BaTiSi<sub>3</sub>O<sub>9</sub>; SiO<sub>2</sub>, 43.71; TiO<sub>2</sub>, 19.32; BaO, 36.97.  
Anal. by Blasdale:

	I	II	Av.
SiO <sub>2</sub>	43.56	43.79	43.68
TiO <sub>2</sub>	20.18	20.00	20.09
BaO	36.34	36.31	36.33
	100.08	100.10	

Pyr. Fuses to a transparent glass at 3. Insol. in HCl but easily attacked by HF and sol. in fused Na<sub>2</sub>CO<sub>3</sub>.

Found associated with *neptunite* (*carlosite*) and *natrolite* near the head waters of the San Benito River, in San Benito County, California. Used as a gem mineral.

**Bentonite.** Non-Metallic Minerals, *Merrill*, p. 243.

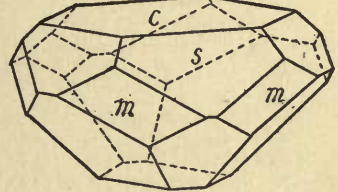
A peculiar soapy clay found in Albany, Crook, Weston and Natrona counties, Wyoming. Considered to have been derived from *labradorite* found in the rocks of the Laramie Mountains.

**BERTHIERITE**, Min., p. 114; App., p. 9. — *Loczka* has confirmed the usual formula FeS.Sb<sub>2</sub>S<sub>3</sub> by analysis of the Bräunsdorf mineral, variations from this are due to impurities, *Zs. Kr.*, **37**, 379, 1902.

Occurs rather abundantly near Charbes, Val de Villé, Alsace, in the veins of Honilgoutte and Trou-du-Loup; analysis agrees with the usual formula, *Ungemach*, *Bull. Soc. Min.*, **29**, 266, 1905.

**BERTRANDITE**, Min., pp. 545, 1028; App., p. 9. — Crystals from Albany, Maine, with new form *l* (203); *Farrington and Tillotson*, *Field Col. Mus., Geol. Series*, **3**, No. 7, 136, 1908.

**BERYL**, Min., pp. 405, 1028; App., p. 9. — Crystals from Russian localities; von *Jeremejew*, *Vh. Min. Ges. St. Pet.*, **35**, 58, 1897; also by *E. Romanovsky*, *ibid.*, p. 63; from *Pisek*, Bohemia; *Kreiči*, *Ber. böhm. Ges. Wiss.*, xxxv, 1902; from *Emmaville*, N. S. W.; *Anderson*, *Rec. Aus. Mus.*, **5**, 300, 1904; *Elba*, described by *G. D'Achiardi*, *Soc. Tosc., Proc. Verb.*, March 13, 1904. Crystals of rose-pink color in modified short prismatic crystals from San Diego Co., Cal. (at Mesa Grande and Pala) (fig.); *Ford*, *Am. J. Sc.*, **22**, 217, 1906; *Zs. Kr.*, **43**, 12; the same author describes unusual crystals from Mt. Mica, Paris, Me., *Haddam Neck*, Conn., etc., *l. c.*; from *Rincon*, Calif.; *Eakle*, *Uni. Calif. Pub.*, **5**, 6, 89, 1907; from pegmatite veins carrying tourmaline in Madagascar, including description of pink beryl rich in alkalis (Cs, Li, Na) having as indices  $\omega = 1.5977$   $\epsilon = 1.5894$ ; *Lacroix*, *Bull. Min. Soc.*, **31**, 234, 1908. Study of crystals, etching figures and optical properties of Brazilian beryls; *Kohlmann*, *Jb. Min., Beil.*, **25**, 135, 1908.



Mesa Grande, Calif.

Analyses of two varieties of beryl from the Motajica-Planina Mts., Bosnia; *Koch*, *Zs. Kr.*, **40**, 298, 1904.

The emerald locality known as Cleopatra's emerald mines has been investigated by *D. A. MacAlister*, *Geol. Jour.*, **16**, 537, 1900; it is situated near *Jebel Sikait* in northern *Etbai* nearly due east of *Edfu*; the extensive workings date back some two thousand years. Star emerald from *Muso*; *Prinz*, *Bull. Ac. Belg.*, 283, 1903. Occurrence at *Heidelberg*, Saxony; *Bergt*, *Ber. Abh. Naturwiss. Ges. Isis*, Dresden, **23**, 1903. From *Vall' Autoliva* and *Cosasca*; *Lincio*, *Att. Acc. Sc.*, Torino, **40**, 870, 1905; at *Torrington* and *Emmaville*, N. S. W.; *Anderson*, *Rec. Aus. Mus.*, **7**, 1, 62, 1908.

**BERYLLONITE**, Min., p. 758. — Refractive indices; *Gaubert*, *Bull. Soc. Min.*, **30**, 108, 1907.

**BEUDANTITE**, Min., p. 868. — Composition discussed in detail by *Hartley*, *Min. Mag.*, **12**, 234, 1900 (cf. *Miers*, *ibid.*, p. 242). The formula deduced is 4Fe<sub>2</sub>O<sub>3</sub>.3P<sub>2</sub>O<sub>5</sub>.3SO<sub>3</sub>.As<sub>2</sub>O<sub>5</sub>.9H<sub>2</sub>O, from the analysis of dark green crystals.

SO <sub>3</sub>	P <sub>2</sub> O <sub>5</sub>	Fe <sub>2</sub> O <sub>3</sub>	PbO	CuO	H <sub>2</sub> O	Gangue
12.72	9.35*	34.61	32.33	1.35	8.45	0.56 = 99.37

\* With trace of As<sub>2</sub>O<sub>5</sub>.

**BINNITE**, Min., p. 118; App., p. 10. — The identity of binnite with tennantite, early announced, is discussed in detail by *Prior and Spencer* in *Min. Mag.*, **12**, 184, 1899. Crystals are isometric-tetrahedral, highly modified, and analysis gives the formula 3Cu<sub>2</sub>S.As<sub>2</sub>S<sub>3</sub>; see discussion of comp. under *Tetrahedrite*.

**BIOTITE**, Min., p. 627; App., p. 10. — *Merxene* with unusual axial angle from andesite of *Assos* in *Troas*, Asia Minor; *Johnsen*, *Centralbl. Min.*, 620, 1908.

Anal. from *Easton*, Pa.; *Eyerman*, *Amer. Geol.*, **34**, 43, 1904; *Zs. Kr.*, **42**, 304. Chemical constitution discussed; *Dalmer*, *Centralbl. Min.*, 51, 1907.

**BISCHOFITE**, Min., p. 176. — *Sp. G.*; *Przibylla*, *Centralbl. Min.*, 234, 1904.

**BISMITE**, Min., p. 200. — Minute pearly scales of this mineral have been found in the oxidized zone of the veins of Goldfield, Nevada. The scales have a brilliant luster and a silvery-white color. The mineral is proven to be uniaxial, negative, with perfect basal cleavage. From triangular markings on the basal planes and the occasional presence of striated faces corresponding to rhombohedrons it appears to be hexagonal, rhombohedral and not orthorhombic as usually stated. Measurements of crystals gave  $\frac{c}{a} = 0.5775$ . The following forms were determined:  $c$  (0001),  $o$  (10 $\bar{1}$ 6),  $q$  (10 $\bar{1}$ 5),  $u$  (10 $\bar{1}$ 4),  $k$  (10 $\bar{1}$ 3), (20 $\bar{2}$ 5)?, (10 $\bar{1}$ 2)? Anal. of impure material gave  $\frac{3}{8}$  Insol., 78.94; Bi<sub>2</sub>O<sub>3</sub>, 17.04; H<sub>2</sub>O, 3.96; Fe<sub>2</sub>O<sub>3</sub>, 0.36; total, 100.30. W. T. Schaller (priv. contr.).

**BISMUTH**, Min., p. 13. — Occurs, also bismite, at Pala, San Diego Co., Calif.; Kunz., Am. J. Sc., 16, 398, 1903. Occurrence at Cobalt, Ontario; Miller, Rep. Can. Bureau Mines, Pt. 2, 1905; Zs. Kr., 43, 395.

**BISMUTHINITE**, Min., pp. 38, 1028; App., p. 10.—Occurs with hematite at the Paulina mine, Nacozari, Mexico; analyzed by Headden, Proc. Col. Sc. Soc., 8, 67, 1905.

The supposed tetradymite from Bastnäs, Riddarhyttan, Sweden, has been shown by G. Lindström to be bismuthinite containing 0.95 p. c. Te, G. För. Förh., 28, 198, 1906.

**BISMUTITE**, Min., p. 307. — A basic bismuth carbonate occurring as a botryoidal incrustation showing minute square plates, uniaxial and tetragonal, has been described by A. Arzruni, K. Thaddéeff from Schneeberg, Saxony, Zs. Kr., 31, 238, 246, 1899. The composition 5Bi<sub>2</sub>O<sub>3</sub>.CO<sub>2</sub>.H<sub>2</sub>O is deduced by Thaddéeff from the analysis (after deducting impurities): Bi<sub>2</sub>O<sub>3</sub>, 97.38; CO<sub>2</sub>, 1.83; H<sub>2</sub>O, 0.78 = 99.99.

A bismuth carbonate from the Sierra de S. Luis, Argentina, has given Bodenbender 0.54Ce<sub>2</sub>O<sub>3</sub>, Zs. prakt. Geol., 7, 322, 1899.

**BITUMEN**, Min., p. 1017. — A fossil egg, found in a large pebble in the placer gravels of the Gila river, Arizona, contained crystalline colemanite associated with a tar-like substance in contact with the shell; Morgan and Tallmon, Am. J. Sc., 18, 363, 1904.

**Bityte**. A. Lacroix, C. R., 146, 1369, 1908; Bull. Min. Soc., 31, 241, 1908.

Pseudo-hexagonal. Occurs in minute hexagonal plates which in polarized light show division into six sectors. Crystals often in parallel grouping with basal planes in common. Color yellowish white. Cleavage parallel to base, showing slight pearly luster.  $H. = 5.5$ .  $G. = 3.05$ . Under microscope each sector shows the emergence of an acute negative bisectrix. Indices of refraction between 1.62 and 1.64.

Comp. — A silicate of calcium and aluminium with water. Formula suggested 7(R<sub>2</sub>O + RO), 4Al<sub>2</sub>O<sub>3</sub>.5SiO<sub>2</sub>. Anal. by Pisani:

SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	CaO	BeO	MgO	Li <sub>2</sub> O	Na <sub>2</sub> O	K <sub>2</sub> O	H <sub>2</sub> O
31.95	41.75	14.30	2.27	0.13	2.73	0.40	0.16	6.50 = 100.19

Found as crusts of crystals coating tourmaline, quartz, etc., in pegmatite veins at Maharitra, Madagascar.

Name derived from Mt. Bity where the mineral occurs.

**Blanfordite**. See *Pyrozone*.

**BLEIMALACHITE**. S. F. Glinka and I. A. Antipov, Vh. Min. Ges. St. Pet., p. 468, 1901; Glinka, Centralbl. Min., 281, 1901.

Acicular crystals occurring in druses in the Syrjanovsk mine in the Altai have, according to Antipov, the composition 2CuCO<sub>3</sub>.PbCO<sub>3</sub>.Cu(OH)<sub>2</sub>. The crystals are monoclinic, twins, showing three cleavages; strongly pleochroic (yellow, green).

**BLÖDITE**, Min., p. 946; App., p. 11. — *Simonyite* from Hallstadt proven to be identical with blödit (astrakamite) from Astrakhan; Jaeger, Min. Mitth., 22, 103, 1903. Optical investigation gave: for Na light,  $\alpha = 1.4825$ ,  $\beta = 1.4839$ ,  $\gamma = 1.4866$ ;  $2V$  (calc.) =  $71^\circ 45\frac{1}{2}'$ . Anal. and description of crystals from Hallstadt. Axial ratio derived =  $a : b : c = 1.3492 : 1 : 0.6717$ ;  $\beta = 100^\circ 48\frac{1}{2}'$ . Koechlin; Ann. Hofmus., Wien, 15, 103, 1900; Zs. Kr., 36, 637.

Anal. of material from Chuquicamata, Prov. Antofogasta, Chile; Palache and Warren, Am. J. Sc., 26, 347, 1908; Zs. Kr., 45, 536, 1908.

Formation discussed; van't Hoff and Meyerhoffer, Ber. Ak. Berlin, 678, 1903.

*Natronkalisimomjite*, name given to crystals agreeing with blödit in form but differing slightly in chemical comp. From the salt deposits of Kalusz, Galicia; Koechlin, Min. Mitth., 21, 356, 1902; formation discussed; van't Hoff and Barschall, Ber. Ak. Berlin, 359, 1903.

**Blomstrandine-Priorite.** W. C. Brögger, Die Mineralien der Südnorwegischen Granit-pegmatitgänge, 98, 1906.

Orthorhombic. Axes  $\ddot{a} : \ddot{b} : \ddot{c} = 0.4746 : 1 : 0.6673$ .  $110 \wedge 1\bar{1}0 = 50^\circ 47'$ ,  $120 \wedge 1\bar{2}0 = 87^\circ 1'$ ,  $130 \wedge 1\bar{3}0 = 109^\circ 50'$ ,  $140 \wedge 1\bar{4}0 = 124^\circ 32' 30''$ ,  $100 \wedge 101 = 35^\circ 26'$ ,  $021 \wedge 0\bar{2}1 = 106^\circ 19'$ ,  $110 \wedge 111 = 32^\circ 44' *$ ,  $111 \wedge 1\bar{1}1 = 42^\circ 17' *$ ,  $010 \wedge 121 = 52^\circ 17'$ .

Forms:  $a$  (100),  $b$  (010),  $c$  (001),  $m$  (110),  $r$  (120),  $n$  (130),  $t$  (140),  $x$  (021),  $d$  (101),  $p$  (111),  $\pi$  (121)

Crystals tabular  $\parallel b$ , the most prominent combination being  $b$ ,  $n$  and  $c$ .  $b$  is horizontally striated. Fracture conchoidal. Brittle.  $G. = 4.82-4.93$ . Luster submetallic. Color brownish black.

Comp. — Niobates and titanates of yttrium, erbium, cerium and uranium similar to the euxenite-polycrase series.

Formula contains (Br.) the following molecules:  $\begin{matrix} \text{II} & \text{I} \\ (\text{R}, \text{R}_2) & [(\text{Nb}, \text{Ta})\text{O}_3]_{2z} \\ (\text{U}, \text{Th}) & [(\text{TiO}_3)_2]_y, (\text{Y}, \text{Ce}) & [(\text{TiO}_3)_3]_x \end{matrix}$ . Blomstrandine and priorite are the end members of a series which give the following ratios of  $\text{Nb}_2\text{O}_5 : \text{TiO}_2 = 1 : 2$  (Priorite),  $1 : 4$  (Blomstrandine from Arendal),  $1 : 6$  (Blomstrandine from Hitterö).

Anal. — I and II, Blomstrand (loc. cit.); III Prior, *ibid.*, and Min. Mag., 12, 97.

	$\text{Nb}_2\text{O}_5$	$\text{Ta}_2\text{O}_5$	$\text{TiO}_2$	$\text{SnO}_2$	$\text{SiO}_2$	$\text{ZrO}_2$	$\text{UO}_2$	$\text{UO}_3$	$\text{ThO}_3$	$(\text{Y}, \text{Er})_2\text{O}_3$
I. Hitterö	17.99	0.89	32.91	0.12	0.38	<i>tr.</i>	4.01	....	7.69	28.76
II. Arendal	23.35	1.15	27.39	0.18	0.40	1.33	5.35	....	4.28	25.62
III. Swaziland (Priorite)	36.68	....	21.89	0.29	2.12	....	0.49	2.14	0.61	17.11

	$(\text{Ce}, \text{La}, \text{Di})_2\text{O}_3$	$\text{FeO}$	$\text{MnO}$	$\text{CaO}$	$\text{ZnO}$	$\text{PbO}$	$\text{MgO}$	$\text{Na}_2\text{O}$	$\text{K}_2\text{O}$	$\text{H}_2\text{O}$
	1.97	1.48	0.27	1.02	....	0.06	0.04	0.22	0.19	1.88 = 99.88
	2.48	1.43	0.30	1.80	0.09	0.84	0.15	0.90	0.18	2.56 = 99.78
	4.32	5.63	0.19	4.12	....	....	0.22	....	....	3.69 = 99.50

Brögger considers that the euxenite-polycrase and the priorite-blomstrandine series are dimorphous.

Obs. Originally found in a pegmatite vein at Urstad on the island of Hitterö, also observed from the neighborhood of Arendal and in other localities in southern Norway. Blomstrandine named from Prof. C. W. Blomstrand. The name is not to be confounded with *blomstrandite*. Priorite was named from G. T. Prior of the British Museum.

[Brögger (l. c.) shows that *blomstrandine* could be referred to the *euxenite* axes, but because of their difference in habit and because in one case a crystal of *blomstrandine* was observed on a crystal of *polycrase* in parallel position and orientated according to the position adopted above he considers that blomstrandine and euxenite should have distinct axes.]

BOBIERRITE, Min., p. 817. — On the artificial reproduction of crystals; A de Schulten, Bull. Soc. Min., 26, 81, 1903.

BOLEITE, PSEUDO-BOLEITE, CUMENGITE. These closely associated and related species have been studied by G. Friedel, Bull. Soc. Min., 29, 14, with the following results.

*Boleite*. Tetragonal, pseudo isometric. Axis,  $c = 3.996$ .  $001 \wedge 101 = 75^\circ 57'$ . Forms (001), (101).

Twinning: Each crystal is made up of three individuals, the  $c$  axis in each case being parallel to a cubic axis. The basal planes of each individual form the pseudo cubic faces. Cleavages (1) (001) perfect, (2) (100) poor, (3) (101) good.  $G. = 5.054$ . Luster pearly on cleavage (001). Color pure Prussian blue, in thin section somewhat more green than with cumengite. Powder blue with a greenish tint.

Optically. — Strength of birefringence = 0.020. In thin sections crystals show isotropic interior surrounded by a birefringent border. Isotropic center considered to be caused by a mixture of the three individuals. The two zones were proven identical chemically (see below).

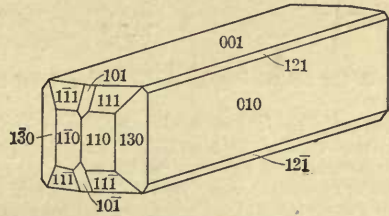
Comp. —  $9\text{PbCl}_2 \cdot 8\text{CuO} \cdot 3\text{AgCl} \cdot 9\text{H}_2\text{O} = \text{Pb } 49.93, \text{Cl } 17.13, \text{AgCl } 11.54, \text{CuO } 17.05, \text{H}_2\text{O } 4.35$ .

Anal. — I of interior isotropic zone, II of exterior birefringent zone.

	Pb	Cl	AgCl	CuO	$\text{H}_2\text{O}$	Insol.
I.	49.16	17.04	12.03	17.17	4.35	0.21 = 99.96
II.	49.52	17.28	11.16	17.20	4.35	0.25 = 99.76

*Pseudo-boleite*. Tetragonal. Axis  $c = 2.023$ .  $001 \wedge 101 = 63^\circ 42'$ .

Forms (001), (100), (110), (101), (112). Always observed in parallel growth on boleite, with face (001) of pseudo-boleite in contact with (001) of boleite. Frequently occurs as raised crystalline masses on the different pseudo cubic faces of boleite, leaving reentrant angles along the cubic edges, or it may completely envelop the latter.



Blomstrandine.

Cleavage (1) (001) perfect, (2) (101) perfect.  $G. = 4.85$  (?). Pearly luster on cleavage (001).  
Optically —. Strength of birefringence = 0.032.

Comp. —  $5\text{PbCl}_2, 4\text{CuO}, 6\text{H}_2\text{O} = \text{PbCl}_2 76.52, \text{CuO } 17.51, \text{H}_2\text{O } 5.97$ .

Anal.:	*	$\text{PbCl}_2$	$\text{CuO}$	$\text{H}_2\text{O}$
		77.5	16.9	5.5 = 100.00

\* After deducting  $1.6\text{AgCl}$  and corresponding amounts of other constituents to form boelite molecule.

*Cumengite*. Tetragonal. Axis  $c = 1.625$ .  $001 \wedge 101 = 58^\circ 24'$ .

Forms (001), (101), (110). Occurs in parallel position with boelite and pseudo-boelite, sometimes completely enveloping them.

Cleavage (101) very good, (110) good, (001) poor. Distinguished from the other members of the group by lack of pearly luster on cleavage faces, and by a purer blue color in thin section and in powder.  $G. = 4.67$ .

Optically —. Strength of birefringence = 0.1.

Comp. —  $4\text{PbCl}_2, 4\text{CuO}, 5\text{H}_2\text{O} = \text{Pb } 54.46, \text{Cl } 18.68, \text{CuO } 20.93, \text{H}_2\text{O } 5.93$ .

Anal.:	$\text{Pb}$	$\text{Cl}$	$\text{CuO}$	Insol.	$\text{H}_2\text{O}$
	54.47	19.03	20.27	0.19	5.90 = 99.86

These three minerals occur in intimate association and in parallel orientation with each other. Boelite is always the first to form, while pseudo-boelite and cumengite are deposited subsequently and often simultaneously.

*Boothite*. *W. T. Schaller*, Bull. G, Univ. Cal., 3, 207, 1903.

Monoclinic. Axes  $a : b : c = 1.1622 : 1 : 1.500$ .  $\beta = 74^\circ 24'$ .

Forms:  $a$  (100),  $c$  (001),  $m$  (110),  $t$  ( $\bar{1}01$ ),  $z$  ( $\bar{3}01$ ),  $\pi$  ( $\bar{1}12$ ),  $e$  ( $\bar{1}11$ ),  $\sigma$  ( $\bar{1}21$ ).

Usually massive, crystalline, also fibrous. Cleavage basal, imperfect. Fracture uneven. Brittle.  $H. = 2-2.5$ .  $G. = 1.94$ . Color blue, paler than chalcantinite.

Ax. pl.  $\parallel$  (010).  $Bx_a$  nearly  $\perp c$ .

Composition,  $\text{CuSO}_4 + 7\text{H}_2\text{O}$ , or since 1 molecule  $\text{H}_2\text{O}$  goes off only at a high temperature,  $\text{CuSO}_4 \cdot \text{H}_2\text{O} + 6\text{H}_2\text{O}$ .

Analyses 1, 2, 1. c.; 3, Am. J. Sc., 17, 192, 1904.

	$\text{SO}_3$	$\text{CuO}$	$\text{FeO}$	$\text{MgO}$	$\text{H}_2\text{O}$ (105°)	$\text{H}_2\text{O}$ (above 105°)	
1. Leona Heights	28.87	27.83	<i>tr.</i>	<i>tr.</i>	36.64	7.42	= 100.26
2. " "	28.65	28.53	0.28	<i>tr.</i>	43.76		= 101.22
3. Campo Seco	27.25	26.13	0.81	0.64	36.76	4.91 3.96 (Insol.)	= 100.46

Occurs as a secondary mineral at the Alma pyrite mine, near Leona Heights, Alameda Co., and at copper mine near Campo Seco, Calaveras Co., Cal. Chalcantinite is intimately associated with massive boothite. Named after Mr. Edward Booth of the University of California.

**BORACITE**, Min., p. 879; App., p. 11. — F. Rinne shows that the green colored boracites containing iron lose the greater part of their double refraction only when heated to a somewhat higher temperature ( $285^\circ$ ) than is the case with ordinary boracite ( $265^\circ$ ). Author also discusses the internal structure of boracite, with the effect of heat upon variously oriented thin sections. Jb. Min., 2, 108, 1900.

**BORICKITE**, Min., p. 852. — Analysis of material from Trpin, near Beraun, Bohemia;  $\text{P}_2\text{O}_5$ , 20.22;  $\text{Fe}_2\text{O}_3$ , 42.43;  $\text{CaO}$ , 8.63;  $\text{H}_2\text{O}$ , 28.72; giving for the formula,  $\text{Ca}_3(\text{PO}_4)_2 \cdot 3\text{Fe}_3(\text{OH})_5\text{PO}_4 \cdot 20\text{H}_2\text{O}$ ; Preis [Ber. d. k. Böhm. Ges. d. Wiss., 19, 1897], Zs. Kr., 31, 526.

**BORNITE**, Min., p. 77; App., p. 11. — Variation in streak, from gray with bluish tinge (fresh mineral) to greenish (slightly altered); Schroeder van der Kolk, Centralbl. Min., 78, 519, 1901.

Analyses of pure specimens of the massive mineral from Canadian localities ( $G. = 5.055-5.085$ ) and of crystals from Bristol, Conn. ( $G. = 5.072$ ), agree with the formula  $\text{Cu}_5\text{FeS}_4$ , while the usually accepted formula  $\text{Cu}_3\text{FeS}_3$  was probably deduced from analyses of impure material. Harrington, Am. J. Sc., 16, 151, 1903.

**BOTRYOGEN**, Min., p. 972. — Comp.: Analysis by Cleve of botryogen from Falun, Sweden, gave for the formula  $2\text{RO} \cdot \text{Fe}_2\text{O}_3 \cdot 4\text{SO}_3 \cdot 15\text{H}_2\text{O}$ , or as suggested  $\text{Mg}(\text{FeOH})(\text{SO}_4)_2 + 7\text{H}_2\text{O}$ ; Sjöberg, G. För. Förh., 17, 268, 1895; Zs. Kr., 28, 507. Analysis of material from Val de Villé, Alsace; Ungemach, Bull. Soc. Min., 29, 270, 1906.

A variety of botryogen from Knoxville, California, has been called *palacheite* (after Dr. Charles Palache of Harvard University) by Eakle, Bull. G. Univ. Cal., **3**, 231, 1903; its true relations were later recognized by the same author, Am. J. Sc., **16**, 379, 1903.

Found somewhat abundantly at the Redington mercury mine (now the Boston mine), Knoxville, Cal., in loosely coherent aggregates of minute crystals. Habit prismatic, *m* (110), *f* (120) both vertically striated with *c* (001); also subordinate *b* (010) and rare *a* (100), *t* (450), *d* (403) *v* (023), *o* (043), *p* (223), *s* (243). Axial ratio deduced:  $a : b : c = 0.6554 : 1 : 0.5994$ ,  $\beta = 62^\circ 51'$ .

Clearance *b* perfect, *m* distinct. Brittle.  $H. = 1.5 - 2$ .  $G. = 2.075$ . Luster vitreous. Color deep brick-red. Streak pale yellow. Ax. pl.  $\perp b$ .  $c \wedge c (Bx_a) = -12^\circ$ . Indices:  $\alpha = 1.544$ ,  $\beta = 1.548$ ,  $\gamma = 1.572$ .  $2V = 40^\circ 54'$  for Na. Dispersion  $\rho < v$ . Pleochroism strong: *c* deep orange-red, *b* pale red, *a* bright yellow. The composition deduced is the same as that deduced by Cleve as above noted, viz.,  $2MgO.Fe_2O_3.4SO_3 + 15H_2O$ . Analysis:

SO <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	MgO	H <sub>2</sub> O (100°)	H <sub>2</sub> O (above 100°)	
38.37	19.51	9.35	19.53	12.75	= 99.51

BOULANGERITE, Min., p. 129; App., p. 11. — Analyses of material from various localities; Guillemin (Inaug.-Diss., Breslau, 1898), Zs. Kr., **33**, 74.

Occurrence at Voûte Chilhae Canton, Haute-Loire; Gonnard, Bull. Soc. Min., **28**, 23, 1905.

BOURNONITE, Min., p. 126; App., p. 11. — Crystals from Ally, Haute-Loire, France; Richard, Bull. Soc. Min., **27**, 218, 1904; from Pulacayo, Bolivia, with new form *g* (601); Mauritz, [Ann. Mus. Nat. Hung., **3**, 461 or 470, 1905]; Zs. Kr., **44**, 78; from Sarrabus, Sardinia; Millosevich, Rend. Acc. Linc., **15**, (1), 457, 1906.

Analyses of material from Liskeard, Cornwall, and Wolfsberg, Harz; Guillemin, (Inaug.—Diss., Breslau, 1898), Zs. Kr., **33**, 75. Occurs at the mine Argentiera della Nurra, Portotorres, Sardinia (anal., Rimatori); D. Lovisato, Rend. Acc. Linc., **11**, (2), 357, 1902.

BOWENITE, see *Serpentine*.

BOWLINGITE, Min., p. 682. — A related mineral occurs at Beaver Bay and other points on the north shore of L. Superior, derived from the alteration of chrysolite; N. H. Winchell, Am. Geol., **23**, 41, 1899.

Bowmannite, see *Hamlinite*.

BRAUNITE, Min., pp. 232, 1029; App., p. 11. — Crystals from Brazil with following new forms: *r* (013), *d* (111), *v* (122), *w* (344), *f* (121), *z* (353), *g* (153); Koechlin, Min. Mitth., **27**, 266, 1908.

**Eravoite.** W. F. Hillebrand, Am. J. Sc., **24**, 142, 1907.

In small grains and crystal fragments, apparently octahedral. Pale yellow, whiter than pyrite, with a faint reddish tarnish. An iron nickel sulphide carrying vanadium, siliceous and titaniferous matter. The analysis gave:

S	Fe	Ni	CO	V*	Mo	C	H <sub>2</sub> O	TiO <sub>2</sub>	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	
45.06	25.38	15.70	<i>tr.</i>	4.31	0.09	0.47	1.38	0.93	1.93	2.45	= 97.70

\* V<sub>2</sub>O<sub>3</sub> 6.33 or V<sub>2</sub>O<sub>5</sub> 7.66.

Considering the mineral as simply an iron nickel sulphide and calculating to 100% gives S 52.31, Fe 29.46, Ni 18.23, which gives the formula (Fe,Ni)<sub>2</sub>S<sub>2</sub> with Fe to Ni nearly as 5 to 3. It is evidently a highly nickeliferous pyrite.

Occurs disseminated through the vanadium ore in which patronite was found, at Minasragra, Peru. The name suggested is from J. J. Bravo who described the occurrence.

BREISLAKITE, Min., pp. 386, 391; App., p. 11. — Probably identical with ilvaite (lievrite); Weinschenck, Zs. Kr., **37**, 442, 1902. Occurs as a product of the eruptions of Vesuvius of 1895-99; R. V. Matteuci, Centralbl. Min., **48**, 1901, cf. Zambonini, *ibid.*, p. 401.

BREITHAAPTITE, Min., pp. 72, 1029; App., p. 11. — Reference in App. I to anal. of *arite* from Sardinia should read "quoted by Lovisato" etc.

BREUNNERITE, Min., p. 274. — Occurrence near Avigliana, Italy, with anal.; Piolti, Att. Acc. Torino, **41**, 1066, 1906.

**Britholite.** Chr. Winther, Medd. om Grönland, **24**, 190, 1901.

Orthorhombic. In pseudo-hexagonal prisms, formed by twinning parallel to the prism *m*,  $mm'' = 63^\circ 34'$ , six individuals unite with their optic axial planes meeting in the vertical axis.

Forms: *b* (010), *m* (110), *z* (130), *d* (021), *p* (111).

Angles:  $bm = 58^\circ 13'$ ,  $bd = 49^\circ 48'$ , hence the approx. ax. ratio,  $\delta: \bar{b}: b = 0.620: 1: 0.423$ .

Cleavage not observed. Fracture uneven. Brittle. H. = 5.5. G. = 4.446. Luster greasy to vitreous. Color brown. Opaque. Optically negative. Birefringence weak. Ax. plane  $\parallel$  (100).  $Bx_a \perp c$ .

Composition; a complex silicate and phosphate of the cerium metals and calcium, formula uncertain.

Analysis, Chr. Christansen:

SiO <sub>2</sub>	P <sub>2</sub> O <sub>5</sub>	(Ce,La,Di) <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	CaO	MgO	Na <sub>2</sub> O	H <sub>2</sub> O	F
16.77	6.48	60.54	0.43	11.28	0.13	1.85	1.27	1.33 = 100.08.

Brought from the nephelite-syenite region of Julianehaab, South Greenland, by G. Flink in 1897 (Medd. om Grönland, **14**, 245, 1898); found at Nanjakasik in pegmatitic veins with arfvedsonite, eudialyte, streenstrupite, nephelite, sodalite, ægirite.

Named from  $\beta\rho\dot{\iota}\delta\omicron\varsigma$ , weight, in allusion to the high specific gravity.

**BROCHANTITE**, Min., p. 925. — Crystals from Utah show the new form (532); Zambonini, Zs. Kr., **34**, 238, 1901. Occurs rather commonly in prismatic crystals, often intergrown with malachite, at various points in the Clifton-Morenci copper district; most abundant in fissure veins in porphyry. Lindgren and Hillebrand, Am. J. Sc., **18**, 458, 1904.

Analysis of specimen from Chile; Arzruni and Thaddéeff, Zs. Kr., **31**, 245, 1899. Containing 2.35% As<sub>2</sub>O<sub>3</sub> from Copacquire, Province of Tarapacá, Chile; Keller, Proc. Amer. Phil. Soc., **47**, 82, 1908.

Occ. at Rosas, Sardinia; Riva, Rend. Acc. Linc., **8**, (1), 347, 1899.

**BRÖGGERITE**, see *Uraninite*.

**BROMARGYRITE**, see *Cerargyrite*.

**BROMYRITE**, see *Cerargyrite*.

**BROOKITE**, Min., pp. 243, 1029; App., p. 12. — Crystals from the Piattagrande, near Sondalo, Veltlin, with (324); Brugnatelli, Zs. Kr., **32**, 355, 1899; Rend. R. Inst. Lomb., **32**, 1405, 1899; complex crystals from Trenadoc with  $\theta'$  (5.13.17); habit hemihedral but etching figures normal orthorhombic; Busz, Jb. Min., **2**, 135, 1901. From Brindletown, N. C., prismatic in habit, often complex with new forms,  $\tau$  (101),  $\sigma$  (324),  $\beta$  (5.4.10),  $\nu$  (146) (fig.); Robinson, Am. J. Sc., **12**, 182, 1901. Crystals in gneiss at Freiberg; Kolbeck, Centralbl. Min., 547, 1908; from Somerville, Mass.; Palache, Festschr., siebzigsten Geburtstage, H. Rosenbusch, p. 314, 1906.

Effect of low temperatures upon optical properties; Panichi, [Mem. Acc. Linc. **4**, 389, 1902]; Zs. Kr., **40**, 88. Refractive indices; Taubert, [Inaug.-Diss., Jena, 1905]; Zs. Kr., **44**, 313.

Anal. from Magnet Cove, Ark.; Pfeil, [Inaug.-Diss., Heidelberg, 1901]; Centralbl. Min., 144, 1902. Discussion of formula, see *Rutile*.

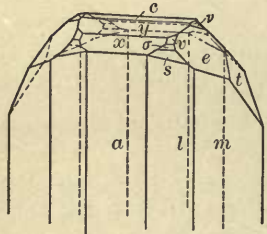
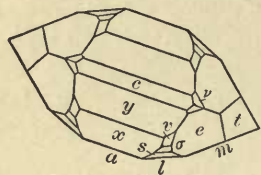
Occurrence in quartzite, Shankille, Co. Dublin, Ireland; O'Reilly, [Proc. Roy. Dublin Soc., **8**, 691, 1898]; Zs. Kr., **32**, 293; from the Bristenstock, near Amsteg, Switzerland; Pearce and Fornaro, Arch. Sc. Phys. Genève, (4), **10**, 435, 1900; with octahedrite in minute crystals in the Cleveland ironstone, England; Lindsley, Min. Mag., **14**, 96, 1905.

**Brostonite**. *P. Poni*, Min. Roumanie, p. 41 (Am. Sci. Univ. Jassy, **1**, 53, 1900); Zs. Kr., **36**, 199. A decomposition product of rhodochrosite occurring in crystalline schists at several points near Brosteni, Roumania. Occurs in dull black friable and compact masses, with submetallic luster on the fresh fracture.

In composition a manganite of manganese and ferrous iron, but variable in specimens from different localities.

Analyses:

	MnO <sub>2</sub>	MnO	FeO	CaO	MgO	H <sub>2</sub> O	Gangue
1. Holda	52.40	6.16	11.47	3.05	...	11.97	14.75 = 99.80
2. Dorna	68.06	8.96	4.08	3.82	0.61	7.17	5.51 CaCO <sub>3</sub> 1.97 = 100.18
3. Dealul-Ferului	61.95	3.11	12.02	2.70	0.72	10.90	8.20 = 99.60



Brindletown, N.C.



BRUCITE, Min., 252; App., p. 12. — Crystals from the Nikolaje-Maximilianovsk mine, Russia, described by Jeremejew, Vh. Min. Ges. St. Pet., 36, 19, 1899.

Effect of low temperatures upon optical properties; Panichi, [Mem. Acc. Line, 4, 389, 1902]; Zs. Kr., 40, 89.

Occurrence (with anal.) from Lyssogorsk, Caucasus; Karpinsky, [Verh. russ. min. Ges., 42, Prot. 21, 1905]; Zs. Kr., 43, 70. In chalk from Teulada, Sulcis, Sardinia; Peruzzi, Rend. Acc. Linc., 14, (2), 83, 1905.

**Brugnatellite.** *E. Artini*, Rend. Acc. Linc., 18, (1), 3, 1909.

Micaceous, lamellar. Perfect cleavage. Color flesh pink. Faint pearly luster. Uniaxial, negative. Opt. axis  $\perp$  to cleavage plane.  $\omega = 1.533_{\text{Na}}$ . Absorption  $\omega > \epsilon$ ;  $\omega =$  yellow red,  $\epsilon =$  colorless.

Comp.  $\text{MgCO}_3 \cdot 5\text{Mg(OH)}_2 \cdot \text{Fe(OH)}_3 \cdot 4\text{H}_2\text{O}$ .

Anal.:

MgO	MnO	Fe <sub>2</sub> O <sub>3</sub>	CO <sub>2</sub>	H <sub>2</sub> O	Insol.
42.79	1.80	13.20	7.78	33.77	1.03 = 100.37

Found in an old asbestos mine at Torre Santa Maria, Val Malenco, Lombardy. Named in honor of Professor Luigi Brugnatelli of the University of Pavia.

**Brunsvigite.** *J. Fromme*, Min. Mitth., 21, 171, 1902.

In cryptocrystalline and small foliated masses sometimes forming spherical radiated aggregates. The folia under the microscope (Tschermak) have a hexagonal outline, are cleavable and show a uniaxial figure and negative double refraction; normal to the cleavage the color is olive-green, parallel to it yellow-green.

H. = 1-2. G. = 3.01. Luster vitreous to greasy, on cleavage folia of the mass dull. Color green to dark leek-green. Translucent.

In composition not far from the metachlorite of the Büchenberg and like it classed with the leptochlorites. Calculated formula:  $6\text{SiO}_2 \cdot 2\text{Al}_2\text{O}_3 \cdot 9\text{MgO} \cdot 8\text{H}_2\text{O}$ .

Anal.:

SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	FeO	MnO	CaO	MgO	H <sub>2</sub> O	H <sub>2</sub> O [hydr.]
27.88	15.81	1.77	31.92	0.51	0.20	9.52	11.97	0.15 = 99.73.

In powder easily decomposed by acids with the separation of pulverulent silica.

Occurs in the gabbro of the Radauthal in the Harz, filling crevices and coating quartz and calcite.

BRUSHITE, Min., p. 828. — Optical characters of crystals from the island of Mona, W. Indies; Klein, Ber. Ak. Berlin, 720, 1901. Artificial formation of crystals; A. de Schulten, Bull. Soc. Min., 26, 11, 1903.

CABRERITE, Min. p. 819. — Crystals from Laurium; Sachs, Centralbl. Min., 198, 1906, with the forms:  $a$  (100),  $b$  (010),  $m$  (110),  $w$  ( $\bar{1}01$ )  $v$  ( $\bar{1}11$ ); axial ratio  $a : b : c = 0.82386 : 1 : 0.77672$ ,  $\beta = 73^\circ 31'$  deduced from the angles:  $aw = 55^\circ 30'$ ,  $wv' = 65^\circ 15'$ ,  $mv = 44^\circ 53'$ ; also calc.  $mb = 51^\circ 42'$ .

Analysis:

G. = 3.01	As <sub>2</sub> O <sub>5</sub>	NiO	CoO	FeO	MgO	H <sub>2</sub> O
	40.45	26.97	tr.	1.10	6.16	25.26 = 99.94

Artif.; de Schulten, Bull. Soc. Min., 26, 87, 1903.

CACOXENITE, Min., p. 848; App., p. 12. — Occurs at Ober-Rosbach, Taunus Mts., Prussia, with manganese ores; Wittich and Neumann, Centralbl. Min., 656, 1902.

Optical character; Mann, [Inaug. — Diss., Leipzig, 1904]; Zs. Kr., 42, 665.

**Cadmiumoxyd.** *E. Wittich* and *B. Neumann*, Centralbl. Min., 549, 1901.

Isometric, in minute octahedrons, sometimes with cubic faces, also as penetration twins; forms a very thin coating, of black color and brilliant metallic luster, upon calamine from Monte Ponì, Sardinia; also in part pulverulent. H. = 3. G. = 6.146.

Easily soluble in hydrochloric acid. Analysis gave: Cd 87.5, O 12.5 = 100. The associated calamine contains no cadmium.

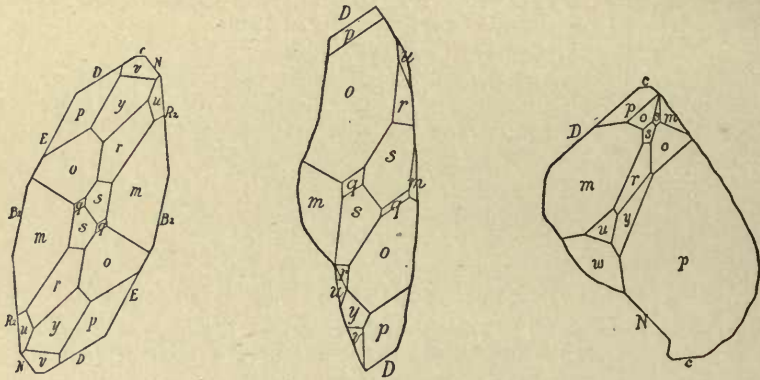
The artificial mineral has been noted in the muffles of zinc furnaces (cf. Werther, J., pr. Ch., 55, 1852) in octahedrons with  $a$ ,  $d$ ,  $n$ . Also obtained (Wittich and Neumann) by burning cadmium in an atmosphere of oxygen; crystals cubic, cleavable, probably  $\parallel o$ .

CALAMINE, Min., p. 546; App., p. 12. — The supposed new form (311) from Moresnet (App. I, p. 12) is really identical with (211); Buttgenbach, Ann. Soc. G. Belg., 26, cliii, 1899. Crystals from Leadville, Colo.; Farrington and Tillotson, Field Col. Mus., Geol. Series, 3, No. 7, 138, 1908.

Composition discussed; Clarke and Steiger, Am. J. Sc., 8, 249, 1899. Rôle of water and discussion of chem. comp.; Zambonini, Mem. Acc. Sci. Napoli, 14, 35, 1908.

Occurrence at Broken Hill, N. W. Rhodesia; Spencer, 15, 34, 1908.

**CALAVERITE**, Min., p. 105. — **Cryst.** — Crystals of fine quality have been found at Cripple Creek and have been the subject of study by Penfield and Ford, (figs.), Am. J. Sc., 12, 225, 1901; Zs. Kr., 35, 5, and by Smith, Min. Mag., 13, 122; Zs. Kr., 37, 209. The crystals are prismatic, being deeply striated in this zone; they show monoclinic symmetry, the striated prism zone being parallel to the ortho axis; the terminal faces are many, often very small; they are arranged in a number of prominent zones but with few exceptions only very complicated symbols can be assigned to them; by selecting certain prominent and frequently recurring faces and assigning simple indices to them and using their angles as fundamentals Penfield and Ford derived the axial ratio as  $a : b : c = 1.6313 : 1 : 1.1449$ ;  $\beta = 89^\circ 47\frac{1}{2}'$ , values very close to those assigned to sylvanite. Twins according to two laws are described by same authors and according to the same laws and two more by Smith. The complexity of the symbols necessarily assigned to the majority of the faces makes the problem a very unusual one, there being no evidence of any twinning that could solve it. Smith suggests that it is to be explained by a very intimate twinning and that the different faces are to be referred to five distinct lattices which are incongruent but not independent and which have the prism zone in common.



Calaverite, Cripple Creek.

Analyses of material from Cripple Creek by Penfield, Am. J. Sc., 12, 246, 1901, by Prior, Min. Mag., 13, 149; from Kalgoorlie quoted by Spencer, Min. Mag., 13, 271, prove the formula to be  $\text{AuTe}_2$ .

Occurs abundantly at Kalgoorlie in the East Coolgardie gold district, West Australia, cf. Spencer, Min. Mag., 13, 270, 1903; Carnot, Bull. Soc. Min., 24, 362, 1901 (anal.); C. R., 132, 1301, 1901; Krusch, Centralbl. Min., 199, 1901.

**CALCIOVOLBORTHITE**, Min., p. 790. — A mineral occurring in bright yellow scales found at Little Baby copper prospect 25 miles N. E. of Baker City, Oregon, is provisionally referred to this species. It is a vanadate of copper with some sodium. 22d Ann. Rep. U. S. G. S., II, 644.

**CALCITE**, Min., pp. 262, 1029; App., p. 13. — **Cryst.** — Over 50 forms described as new are to be found in the following papers.

Crystals from Jarow near Wran (south of Prag); Polak, Lotos, Prag, 77, 1897; Zs. Kr., 31, 528; in coral chalk at Bremke; Fromme, (10, 11, Jahresber. d. Ver. f. Naturw., Braunschweig, 1897-1898), Zs. Kr., 32, 192; Villers-en-Fague; Buttgenbach, Ann. Soc. Geol. Belg., 25, 73, 1898; Lake Superior with lists of 81 forms, 31 new; Palache, Geol. Sur. Mich., 6, 161, 1898; Iceland; Jeremejew, [Bull. Acad. Sc., St. Pétersbourg, 9, 5, 1898]; Zs. Kr., 32, 428; Nordmark, Sweden; Moberg, Geol. För. Förh., 21, 349, 1899; crystals of different types in parallel growth from Ofner mountains; Melzer, (Föld. Köz., 23, 160, 217, 1899); Zs. Kr., 34, 709; also Argentine, Kan., and Kansas City, Mo.; Rogers, Am. J. Sc., 9, 365, 1900; twins and study of crystal forms from Joplin, Mo.; Farrington, Bull. Field Mus. Geol. Series No. 7, 1, 221, 1900; Zs., Kr., 36, 78; Gräsberg, Dalarne, Sweden; Weibull, Geol. För. Förh., 22, 19, 1900. Twins, Union Springs, Cayuga Co., N. Y. (figs.); Egremont and Pallafat, Cumberland; Stank mine, Lancashire; from elaeolite-syenite, Montreal; Penfield and Ford, Am. J. Sc., 10, 237, 1900; Zs. Kr., 33, 6; Tharandt, Saxony; Sachs, Zs. Kr., 36, 449; Shullsburg, Wis., and other neighboring localities, Saguache Co., Colo., Frizington, Eng., from Eudora, Kan., Kansas City, Mo.; Rogers, Am. J. Sc., 12, 42, 1901; Dortmund; Beykirch, Centralbl. Min., 494, 1901; from Pradalunga, Val Seriana, Italy; Artini, Att. Soc. Milano, 40, 269, 1901; from Trapp-Region of N. J.; Rogers, Sch. of Mines Quart., 23, 336, 1902; Zs. Kr., 38, 693; twins, Somerset; Bowman, Min. Mag., 13, 329; twins, Joplin, Mo.; Sterrett, Am. J. Sc., 13, 73, 1904; Rákó and Szentandrás, Hungary; Zimányi, [Föld. Köz., 35, 491 or 544, 1905]; Zs. Kr., 44, 72; Guggiate, Lake Como; Repossi, Att. Soc. Ital. Sc. Nat., Milano, 44, 106, 1905; Grand Rapids,

Mieh., Hobbs, Amer. Geol., **36**, 179, 1905; Zs. Kr., **43**, 394; Rondout, Ulster Co., and Union Springs Cayuga Co., N. Y.; Whitlock, N. Y. State Mus., Bull. **98**, 1905; East Greenland; Böggild, Medd. om Grönl., **23**, 106, 1905; Narsarsuk, Greenland; id., *ibid.*, **33**, 98, 1906; Simplon Tunnel; Abraham, Mem. Soc. Liège, **6**, 11, 1906; twins from marble of Carrara; D'Achiardi, Proc. Soc. Sc. Tosc., Mem. **21**, 1905; also Mar. 11, 1906; Rikuchū Province, Japan; Jimbō, Beitrage Min Japan, **2**, 26, 1906; twin crystals; St. Kreutz, [Denkschr. Wien Akad., **80**, 15, 1906]; Zs. Kr., **45**, 628; crystals from Lyon Mountain, Clinton Co., N. Y.; Whitlock, N. Y. State Mus., Bull. **107**, 58, 1907; Zs. Kr., **43**, 321. West Paterson, N. J.; Whitlock, Am. J. Sc., **24**, 426, 1907; "Kis Strázsahegy," near Esztergom, Hungary; Franzenau, Zs. Kr., **43**, 468; Bojca, and Salgótarján, Hungary, from "Kühlen Tal" near Buda-pest; Tóborffy, Zs. Kr., **44**, 604, 605, 607; from Piszke, Tata-bánya and Torockó, Hungary; Tóborffy, Földt. Közl., **37**, 308, 1907. Andreasberg, Harz; England; San Francisco, Calif.; Hillsboro, N. M.; Lincoln, R. I.; Terlingua, Texas; Schaller, Zs. Kr., **44**, 321; Terlingua, Texas; Zeller, Centralbl. Min., **18**, 1907; stalactite of rhombohedral crystals, Potter Creek cave, Shasta Co., Calif.; small crystals from Terlingua, Texas; Eakle, Uni. Calif. Pub., **5**, 6, 89, 91, 1907; associated with diopside from Mindouli, French Congo; Lacroix, Bull. Soc. Min., **31**, 258, 1908; crystals in a marble inclusion in basalt at Weitendorf in Styria; Leitmeier, Centralbl., Min., **257**, 1908; figures of various twins, etc.; Lewis, Min. Mag., **15**, 62, 1908; crystals from Joplin, Mo., and Bellevue, Ohio; Farrington and Tillotson, Field Col. Mus., Geol. Series **3**, No. 7, 140, 144, 1908.

**Opt.** — Fluorescence; Schincaglia, [Il Nuovo Cimento, Pisa, **10**, 212, 1899]; Zs. Kr., **34**, 312; dispersion of iceland spar; Carvallo [Jour. de physique, **9**, 465, 1900]; Zs. Kr., **35**, 629; phosphorescent calcites from Fort Collins, Colo., and Joplin, Mo.; Headden, Am. J. Sc., **21**, 301, 1906.

Studies of solution and etching figures, etc.; Gaubert, Bull. Soc. Min., **24**, 326, 1901; also Goldschmidt and Wright, Jb. Min., Beil. **17**, 355, 1903; *ibid.*, **18**, 335, 1904; pits produced by polishing basal planes; Samojloff, Zs. Kr., **39**, 19.

Experiments with compression of marble at varying pressures and temperatures; Adams and Nicholson, [Proc. Roy. Soc. London, **67**, 228, 1900]; Zs. Kr., **36**, 82; also Rinne, Jb. Min., **1**, 160, 1903.

Siliceous calcites, Penfield and Ford, Am. J. Sc., **9**, 352, 1900, from Washington Co., S. D., CaCO<sub>3</sub>, 40%, quartz sand, 60%, apparently rounded pyramids, near the form  $\gamma$  (8.8.16.3) (the sand stone crystals from near Heidelberg, Ger., considered to have the same form; Cohen, Zs. Kr., **37**, 610); from S. Dakota and Goshen Hole region, Wy., showing combinations of acute and obtuse rhombohedrons; Barbour and Fisher, Am. J. Sc., **14**, 451, 1902; siliceous calcites; Delkeskamp, Zs. für Naturwiss., Halle, **75**, 185, 1902; sand-calcite concretions from Salton, Calif.; Nichols, Field Columbian Mus., No. 111; Zs. Kr., **44**, 539.

Studies as to whether calcite or aragonite is formed under varying conditions when CaCO<sub>3</sub> is precipitated from solution; Meigen, (Ber. Naturfors. Gesellsch., Freiburg, **13**, 40, 1902), Zs. Kr., **40**, 524.

Fetid calcite from Chatham, Canada, analyzed by Harrington, Am. J. Sc., **19**, 345, 1905, showed the presence of H<sub>2</sub>S in small amount.

Containing Co, from Traversella; Spezia, Att. Acc. Torino, **42**, 409, 1907.

Studies concerning origin, structure, physical properties and associated minerals of marble by Vogt, Zs. pr. Geol., **6**, 4-16, 43-52, 1898. The minerals of the marble of Carrara; D'Achiardi, Att. Soc. Tosc., **21**, (1), 49; (2), 236, 1905; **22**, 94, 1906; Giampaoli, sep. pub.; Zs. Kr., **43**, 492.

Calcite and aragonite in coral rock; Sep. Pub., The Atoll of Funafuti, Roy. Soc., 1904.

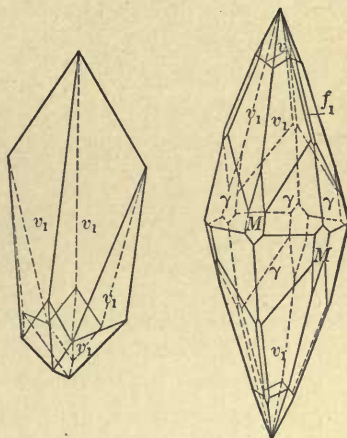
Portland cement clinkers have been minutely studied by Törnebohm. See *alith*.

**CALCIUM ORTHOSILICATE.** Artif. formation; Day and Shepherd, Am. J. Sc., **22**, 280, 284, 1906.

**CALCIUM OXIDE.** — Crystalline form and density of fused lime; Day and Shepherd, Am. J. Sc., **22**, 271, 1906.

**CALEDONITE**, Min., p. 924; App., p. 13. Occurs in crystals at the Stevenson-Bennett mine, Organ Mts., New Mexico; O. C. Farrington, Bull. Field Col. Museum, Geol., **1**, 224, 1900; also at the Alice mine, near Butte City, Montana; Rogers, Am. J. Sc., **12**, 47, 1901. In deep sky-blue crystals at the silver mines of Mt. de Challacollo, Atacama, Chile; G. Berg, Min. petr. Mitth., **20**, 390, 1901. An analysis by Brunk, after deducting 2.31 insol., gave:

SO <sub>3</sub>	PbO	CuO	CO <sub>2</sub>	H <sub>2</sub> O
14.15	69.18	9.73	3.16	3.78 = 100



Union Springs.

The  $\text{CO}_2$  here belongs to the caledonite and is not due to impurity (cf. Min., p. 925); the formula deduced is  $5[4\text{PbSO}_4 \cdot 3\text{Pb}(\text{OH})_2] + 2[4\text{CuCO}_3 \cdot 3\text{Cu}(\text{OH})_2]$ .

From Sardinia; Pelloux, Att. Acc. Linc., **13**, (2), 34, 1904.

**Californite**, see *Vesuvianite*.

**CALOMEL**, Min., p. 153; App., p. 13. — Occurs in square prisms and in tabular crystals with other mercury minerals at Terlingua, Texas; Moses, Am. J. Sc., **16**, 262, 1903; crystals from same locality showing  $\delta$  (016) and  $d$  (031) as new forms, and from Avala, Spain; Goldschmidt and Mauritz, Zs. Kr., **44**, 393; Schaller (priv. contr.) on crystals from Terlingua gives new form  $K$  (553) and deduces  $c = 1.7234$ .

**CANCRINITE**, Min., pp. 427, 1029. — A cancrinite-syenite has been described (anal.) by Sundell, Bull. Comm. G. Finland, No. 16, 1905. Effect of ammonium chloride upon; Clarke and Steiger, U. S. G. S., Bull., **207**, 1902. Discussion of chem. comp.; Zambonini, Mem. Acc. Sci. Napoli, **14**, 43, 1908.

**CANFIELDITE**, App., p. 13. — The true locality of the specimens described by Penfield (Am. J. Sc., **47**, 451, 1894) is shown by Canfield to be Colquehaca, Bolivia, not La Paz. Am. J. Sc., **23**, 21, 1907; spinel twins are noted.

**Carbapatite**; P. Tschirwinsky, [Ann. Géol. et min. Russie, **8**, 8, 1906]; Centralbl. Min., 283, 1907. Name suggested through an error for a supposed crystalline type of podolite,  $3\text{Ca}_3(\text{PO}_4)_2 \cdot \text{CaCO}_3$ . Name withdrawn.

**CARBORUNDUM**, see *Moissanite*.

**Carlosite** = *neptunite*, which see.

**CARNALLITE**, Min., p. 177; App., p. 13. — Large crystals ( $8 \times 6$  cm.) from Beienrode near Königshutter gave the new forms:  $n$  (103),  $g$  (012),  $h$  (032),  $u$  (118),  $t$  (114),  $v$  (126),  $v$  (136). Optical determinations also given and analysis (by Kleinfeldt); Bücking, Ber. Ak. Berlin, 539, 1901. Also, Busz; Ber. Naturhist. Ver., Bonn, **1**, C, 2, 1906; Ber. Med.-naturwiss. Ges. Münster, June, 1906. Sp. G. and artif. formation; Przilyla, Centralbl. Min., 234, 1904; of related compounds of iodine; de Schulten, Bull. Soc. Min., **23**, 5, 1900. Isotrimorphism of carnallite and bromcarnallite; Boeke, Centralbl. Min., 710, 1908.

Deformation under pressure; Rinne, Festschr. siebzigsten Geburtstage, Adolf v. Koenen, 369, 1907.

**CARNOTITE**, App., p. 13. — Description of occurrence in western Colorado with analyses; Hillebrand and Ransome, Am. J. Sc., **10**, 120, 1900. The material is shown to be impure, so that no definite formula can be assigned.

Ratio of radium to uranium; Boltwood, Am. J. Sc., **18**, 97, 1904. Examination by E. P. Adams has shown the absence of helium, Am. J. Sc., **19**, 321, 1905.

**CARPHOLITE**, Min., p. 549. — Occurs in quartz pebbles found in the diluvial deposits of the region of Bernburg, probably derived from the southeastern Harz Mts., near Wippra; Cornu, Centralbl. Min., 77, 1906.

**CASSITERITE**, Min., pp. 234, 1030, 1037; App., p. 14. — Crystals from Pitkäranta with complex new forms; Borgström, Zs. Kr., **40**, 1, 1904; Ævigttut, Greenland; Böggild, Min. Grönl., 91, 1905. Small crystals resembling hexagonal pyramids by repeated twinning on 101, from near La Paz, Bolivia; Spencer, Min. Mag., **14**, 332; pseudomorphs after some unknown monoclinic mineral from Tres Cruces, Bolivia; Pearce, *ibid.*, 345. Crystals from Emmaville; Elsnore; Hognis Creek, near Dundee; The Glen, New England, all in N. S. W., and from Stanthorpe, Queensland; Anderson, Rec. Aus. Mus., **6**, 404, 1907. Secondary twinning lamellæ in crystals from Selangor, Malacca; Johnsen, Centralbl. Min., 426, 1908.

Hidden notes cleavage (or parting)  $\parallel e$  (101) on crystals from the Ross tin mine, near Gaffneys, So. Carolina, Am. J. Sc., **40**, 410, 1905.

From tin gravels, Embabaa district, Swaziland, S. A.; Prior, Min. Mag., **12**, 100; also see Molengraaff, [Trans. G. Soc. S. Africa, **4**, 141, 1898], Zs. Kr., **32**, 301. On the deposits of Mt. Bischoff, Tasmania, see von Fircks, Zs. G. Ges., **51**, 431, 1899; of the Carolinas; Pratt and Sterrett, Bull. **19**, G. Surv. No. Carolina, 1904; discussion as to formation of tin deposits of Campiglia Marittima, Tuscany; Bergeat, Jb. Min., **1**, 135, 1901.

**CATAPLEIITE**, Min., p. 412; App., p. 14. — Crystals from Narsarsuk, Greenland; Flink, Medd. Grönländ, **24**, 93; also see Böggild on optical and crystallographic relationships; *ibid.*, **33**, 106, 1906. Rôle of water in; Zambonini, Mem. Acc. Sci. Napoli, **14**, 54, 1908.

A catapleite-syenite occurs in central Sweden, near the Wettersee; Törnebohm, Sveriges Geol. Und., C, No. 199, 1906.

**CELESTITE**, Min., p. 905; App., p. 14. — **Cryst.** — From the Marienstein mine, near the Tegemsee, Bavaria, (anal.); Sutschinsky, Zs. Kr., **34**, 563, 1901; with (124) prominent, near Mentor, Saline Co., Kansas; Rogers Am. J. Sc., **12**, 48, 1901; from Wymore, Nebraska, id., Sch. Mines Q., **23**, 134, 1902; from Boratella, Romagna, with (017), by Zambonini, Rend. Acc. Linc., **13**, (1), 37, 1904; from Monte Viale, Vicentine Alps; new forms (214), (0.1.16), (119), (117); Billows, Riv. Min. Ital., **31**, 3, 1904; from the Djebel Kebbouch and Djebel Bezine, Tunis (anal. Pisani); Termier, Bull. Soc. Min., **25**, 173, 1902, also see Samojtoff (pseudomorph after barite?), Centralbl. Min., **33**, 1905; from Haring, Tyrol; Koechlin, Min. petr. Mitth., **24**, 114, 1905; from Lyssaja gora near Theodosia, Crimea; Popoff, [Bull. Nat. Moscow, p. 180, 1906]; Zs. Kr., **46**, 221; from Maybee, Michigan, with discussion of occurrence, crystals, natural etching figures and anal.; Kraus and Hunt, Am. J. Sc., **21**, 237, 1906; crystals from sulphur caves near Lornano, Siena, with new forms (327), (019); Manasse, Att. Soc. Tosc., **23**, 1907; from Mokattam and Abou Roach, Egypt, with optical determinations; Couyat, Bull. Soc. Min., **31**, 264, 1908; from Kresty, Saratow, Russia, with new form (177); Surgunoff, Bull. Soc. Nat. Moscow, 435, 1904; Zs. Kr., **43**, 76.

Effect of low temperatures upon optical properties; Panichi, [Mem. Acc. Linc., **4**, 389, 1902]; Zs. Kr., **40**, 89. Etching figures, see under *barite*.

Occurrence near Syracuse, N. Y.; Kraus, Am. J. Sc., **18**, 30, 1904; the general occurrence and distribution of celestite-bearing rocks; id., *ibid.*, **19**, 286, 1905. Occurrence noted at Longue Pointe, Island of Montreal, *ibid.*, **21**, 188, 1906.

**Celith**, see *Alith*.

**CELSIAN**, App., p. 15. — Further investigation proves it to be monoclinic with  $a : b : c = 0.657 : 1 : 0.554$ ;  $\beta = 115^\circ 2'$ . Angles  $001 : 110 = 68^\circ 41'$ ;  $010 : 110 = 59^\circ 14'$ ;  $001 : 201 = 79^\circ 23'$ . Forms: *P* (001), *M* (010), *K* (110), *Y* (201), *T* (110), ( $\bar{1}14$ ), *G* ( $\bar{1}12$ ), *o* ( $\bar{1}11$ ), (331), (311). Twinning general according to Carlsbad law; mamebach and baveno twins also found. Opt. positive. Ax. pl.  $\parallel$  (010);  $c : a = 28^\circ 3'$  in obtuse angle  $\beta$ .  $2V_a = 86^\circ 22'$ .  $\alpha = 1.5837$ ,  $\beta = 1.5886$ ,  $\gamma = 1.5940$ . Anal. given. Strandmark, G. För. Förh., **25**, 289, 1903; **26**, 97, 1904; Zs. Kr., **43**, 89. Also discussion of mixtures of orthoclase and celsian molecules with anal. of a barium potassium feldspar from the Binnenthal. Name *baryta-orthoclase* given to mixtures of celsian and orthoclase.

**CERARGYRITE**, Min., p. 158. — Prior and Spencer (Min. Mag., **13**, 174), as the result of an investigation of the isometric-normal (holosymmetric) silver haloids, conclude that while they should be included under the common group name, *cerargyrite*, sub-species should be recognized as follows: *chlorargyrite*, AgCl; *bromargyrite*, AgBr; *emboleit*, Ag(Cl,Br); *iodemboleit*, Ag(Cl,Br,I). Isomorphous mixtures of AgCl, AgBr, AgI exist in varying proportions. New analyses (Prior) are as follows:

	G	Cl	Br	I	Ag
1. Chañarcillo	6.17	7.11	22.35	10.39	60.37 = 100.22
2. Broken Hill, N. S. W.	6.31	1.96	32.22	8.77	56.93 = 99.88
3. " " "	5.82	14.36	15.85	2.35	67.28 = 99.84
4. " " "	5.66	13.20	19.71	0.16	66.91 = 99.98

In addition to the above group, there is also the rhombohedral-hemimorphic AgI, iodyrite, and the isometric-tetrahedral 4AgI.CuI, miersite.

**Cerepidote**; synonym for *allanite*. Rosenbusch, Mikrosk. Phys. Min., **1**, 2, 286, 1905.

**Ceruleite**, *Cæruleite*. H. Dufet, Bull. Soc. Min., **23**, 147, 1900.

Massive, compact and resembling clay but made up of excessively minute crystals, which polarize in the mass. G. = 2.803. Color turquoise-blue.

Composition:  $\text{CuO} \cdot 2\text{Al}_2\text{O}_3 \cdot \text{As}_2\text{O}_5$ .

Analysis:

$\text{As}_2\text{O}_5$	$\text{Al}_2\text{O}_3$	CuO	$\text{H}_2\text{O}$
34.56	31.26	11.80	22.32 = 99.94

The water goes off only at a high temperature, the loss at  $180^\circ$  being only 1.45 p. c. Soluble in acids, leaving a slight residue consisting of a white clay.

From the Emma Luise gold mine at Huanaco, Taltal province, Chile (cf. Mörücke, Zs. pr. G., **1**, 143, 1893). A white clay associated with the ceruleite, contained 1.8 p. c.  $\text{As}_2\text{O}_5$  but no copper.

**CERUSSITE**, Min., pp. 286, 1030; App., p. 15. — **Cryst.** — Accurate measurements of angles and optical constants on crystals from localities in Westphalia; Ohm, Jb. Min. Beil. **13**, 1, 1899; crystals from Altai, with anal.; Jeremejew [Verhandl. d. kais. russ. miner. Gesellsch., 1898. St. Petersburg, **36**, Protok. 12, 1899], Zs. Kr., **32**, 429; from Malfidano, Sardinia, with pseudomorphs after anglesite and phosgenite; Millosevich, Rend. Acc. Linc., **9**, (1), 153, 1900. Twins from Sardinia described by Hubrecht, with bibliography of mineral, a list of the observed forms and combinations with the relative frequency of occurrence of each form. The following new

forms also given: *T* (034) and *Q* (054), *Zs. Kr.*, **40**, 147; from Mies with the new forms (0.22.1), (0.29.1), (0.33.1), (0.37.1); Barvir, Ber. böhm. Ges. Wiss. xxxvi, 1900; *ibid.*, xvii, xxxiii, 1901; from Santa Rosalia, Peru, with new forms (150) and (310); Buttgenbach, *Ann. Soc. géol. Belg.*, **29**, 103, 1902; from the Alice mine, Butte, Montana, and Phenixville, Pa.; Rogers, *Sch. Mines Q.*, **23**, 136, 1902; multiple twins from Mapimi, Mexico, with new form *A* (304); Goldschmidt, *Jb. Min. Beil.* **15**, 562, 1902; crystals from Valle di Contra, Valsassina, Italy; Artini, *Att. Soc. Milano*, **42**, 107, 1903; from Djebel-Ressas mine, Tunis; Jecker, *C. R.*, **140**, 1410, 1905; Gaeta, L. Como; Repossi, *Att. Soc. Milano*, **43**, 425, 1905; Magnet mine, Tasmania; C. Anderson, *Rec. Austr. Mus.*, **6**, 93, 1905; Traversella; Colomba, *Rend. Acad. Linc.*, **15**, 643, 1906; Broken Hill, N. S. W.; Zeehan, Whyte River and Dundas, Tasmania; Anderson, *Rec. Aus. Mus.*, **6**, 407, 1907; Broken Hill; Spencer, *Min. Mag.*, **15**, 36, 1908; with diopside from Mindouli, French Congo; Lacroix, *Bull. Min. Soc.*, **31**, 257, 1908; Rézbánya with new forms, *M* (0.13.2); *D* (0.11.2); *C* (072); *B* (095); Löw, *Földt. Közl.*, **38**, 205, 1908; Laurium, Greece; Lacroix and de Schulten, *Bull. Soc. Min.*, **31**, 89, 1908

Effect of low temperatures upon optical properties; Panichi, [*Mem. Acc. Linc.*, **4**, 389, 1902]; *Zs. Kr.*, **40**, 88. Luminescence; Pochettino, *Rend. Acc. Linc.*, **14**, (1) 505, (2) 220, 1905.

Analysis of cerussite containing 3.15% SrO from Isle, Custer Co., Colo.; Warren, *Am. J. Sc.*, **16**, 343, 1903.

**CHABAZITE**, *Min.*, p. 589; *App.*, p. 15. — **Cryst.** — Description of crystals from near Rome (with anal.); Zambonini, *Jb. Min.*, **2**, 93, 1902; crystals from Scottish localities; Goodchild, [*Trans. Geol. Soc., Glasgow*, **12**, Suppl., 1-68, 1903]; *Zs. Kr.*, **45**, 307; from East Greenland; Böggild, *Medd. om Grönl.*, **28**, 123, 1905; also *Min. Grönl.*, **571**, 1905. Petersdorf, near Zöptau, Mähren; Kretschner, *Centralbl. Min.*, 609, 1905; Ben Lomond (with anal.) and Inverell, N. S. W., and from Bell Mount, Tasmania; Anderson, *Rec. Aus. Mus.*, **6**, 416, 1907; from basalt of Montresta, Sardinia; Deprat, *Bull. Min. Soc.*, **31**, 189, 1908; also Millosevich, *Rend. Acc. Linc.*, **17**, (1), 270, 1908; and (with anal.); Pelacani, *ibid.*, (2), 68, 1908.

From Golden, Colo.; Patton, *Bull. Geol. Soc. Amer.*, **11**, 461, 1900; *Zs. Kr.*, **36**, 74; from the Buck Creek corundum mine, Clay Co., N. C., (with anal.); Pratt, [*Jour. Elisha Mitchell Sc. Soc.*, **14**, 61, 1897], *Zs. Kr.*, **32**, 603; anal. of chabazite from Maddalena and Montresta, Sardinia; Rimatori, *Rend. Acc. Linc.*, **9**, (2), 146, 1900. Anal. of mineral from syenite from Biella; Zambonini, *Zs. Kr.*, **40**, 263. Occurrence in basalts (with anal.) at Asmara, and Seiket in Eritrea; Manasse, *Proc. Soc. Tosc.*, July, 1906.

Concerning "*herschelite*" from Palagonia, Sicily, and its relations to other similar zeolites; Gonnard, *Bull. Soc. Min.*, **29**, 283, 1906. Also see Di Franco, *Att. Acc. Sci. Nat. Catania*, **15**, 3, 1902.

**Chem. constitution**; McNeil, *Jour. Amer. Chem. Soc.*, **28**, 597, 1906.

**CHALCANTHITE**, *Min.*, p. 944; *App.*, p. 15. — Crystals from the Alma pyrite mine, Leona Heights, Alameda Co., Cal., showed the new forms *l* (120), *g* (141); analysis gave the formula  $\text{CuSO}_4 \cdot \text{H}_2\text{O} + 4\text{H}_2\text{O}$ ; Schaller, *Bull. G. Univ. Cal.*, **3**, 212, 1903. Twinning in artif. crystals. Also new form (131); Boeris, *Att. Soc. Milano*, **44**, 73, 1905.

From Copaqueire, Province of Tarapacá, Chile (with anal.), and associated with it a light blue material in rounded masses which proved to be a double sulphate of copper and magnesium,  $\text{CuSO}_4$  being to  $\text{MgSO}_4$  nearly as 1 : 2. Anal. gave:  $\text{SO}_3$ , 35.70;  $\text{CuO}$ , 12.43;  $\text{MgO}$ , 11.39;  $\text{FeO}$ , 1.01;  $\text{MnO}$ , 0.32;  $\text{NiO}$ , 0.06;  $\text{H}_2\text{O}$ , 38.38; total = 99.29; Keller, *Proc. Amer. Phil. Soc.*, **47**, 81, 1908.

**CHALCOCITE**, *Min.*, p. 55. — Twin, with twinning plane (201), from Cornwall; Milch, *Jb. Min.*, **1**, 155, 1900. Pseudomorphs after galena from Osaruzawa, Prov. Rikuchu, Japan; Wada, *Beitr. Min. Japan*, **1**, 17, 1905; after barite (?), from Grab near Koštunići; Stevanović, *Zs. Kr.*, **45**, 60.

A pulveriform variety occurs at the Champion mine, in the Keweenaw copper region, Michigan; Koenig, *Am. J. Sc.*, **14**, 415, 1902. A prominent mineral in the copper district of Clifton, Arizona; it is of secondary origin, occurs only massive and commonly shows a sooty aspect on the surface. Lindgren and Hillebrand, *Am. J. Sc.*, **18**, 451, 1904; *Bull. U. S. G. S.*, **262**, 45.

**CHALCODITE**, see *Stilpomeleane*.

**Chalcolamprite**. *G. Flink*, *Medd. om Grönland*, **14**, 234, 1898; **24**, 160, 1901.

Isometric, only in small octahedrons, sometimes hollow or otherwise irregular. No cleavage observed. Fracture splintery or subconchoidal. Brittle.  $H. = 5.5$ .  $G. = 3.77$ ; Mauzelius. Luster greasy; crystal faces show a copper-red metallic iridescence. Color dark grayish brown, inclining to red, streak ash-gray. Opaque, translucent in thin splinters. Composition,  $\text{RNb}_2\text{O}_6\text{F}_2 \cdot \text{RSiO}_3$ , or allied to pyrochlore. Analysis, Mauzelius:

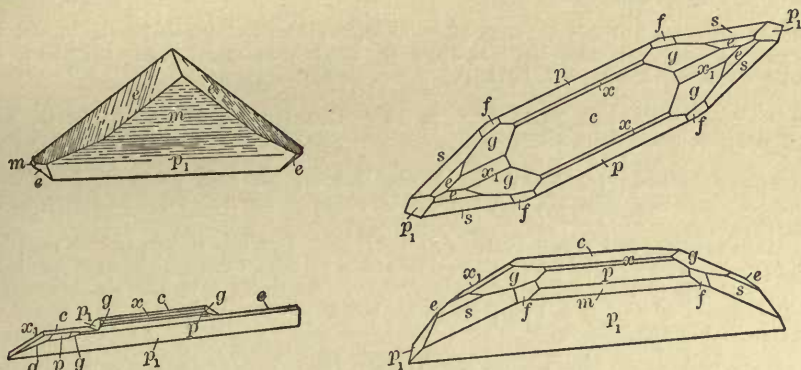
$\text{Nb}_2\text{O}_5$	$\text{SiO}_2$	$\text{TiO}_2$	$\text{ZrO}_2$	$\text{Ce}_2\text{O}_3$ , etc.	$\text{Fe}_2\text{O}_3$	$\text{MnO}$	$\text{CaO}$	$\text{K}_2\text{O}$	$\text{Na}_2\text{O}$	$\text{H}_2\text{O}$	$\text{F}$
59.65	10.86	0.52	5.71	3.41	1.87	0.44	9.08	0.38	3.99	1.79	5.06
											= 102.76 less O (2.13)
											= 100.63

Occurs very sparingly at Narsarsuk, southern Greenland, associated with ægirite.

Named from χαλκός, copper, and λαμπρός, luster.

CHALCOPHYLLITE, Min., p. 840. — Analysis of material from Cornwall (?); Hartley, Min. Mag., 12, 120.

CHALCOPYRITE, Min., pp. 80, 1030; App., p. 15. — Cryst. — Twins from Burgholdinghausen; Baumhauer, Zs. Kr., 31, 269. Crystals of unusual habit and twin crystals from Cornwall; Lewis and Hall, Min. Mag., 12, 324. From Visé, Belgium, showing new form (115); Buttgenbach, Ann. soc. géol. Belg., 25, civ, 1898. Small crystals, rich in forms, from Pulacayo, Bolivia; Todoroff, Zs. Kr., 39, 366. New forms,  $x$  (113),  $\eta$  (771),  $\tau$  (509). Twins; twinning planes (111) and (101). Crystal, 4<sup>cm</sup> diam., from Somerville, Mass., with  $m$  (110) and  $e$  (101); Richards, Am. J. Sc., 17, 425, 1904. From Botes, from Kapnik, rich in forms, from Schennitz; Mauritz, Zs. Kr., 40, 588. Traversella, with new forms,  $Y$  (515),  $\mu$  (11.11.1); Colomba, Rend. Acc. Line., 15, 639, 1906;



Arakawa, Japan.

Val de Villé, Alsace; Ungemach, Bull. Soc. Min., 29, 213, 1906; crystals of unusual habit from Arakawa, Japan, (figs.); Ford, Am. J. Sc., 23, 59, 1906; the same with a general discussion of the crystal structure of the mineral; Beckenkamp, Zs. Kr., 43, 43; from Besano, Italy; Repossi, Att. Soc. Milano, 47, 89, 1908; Bréole, Basses-Alpes, France; Lacroix, Bull. Soc. Min., 31, 353, 1908.

Etching figures; Himmelbauer, Min. Mitth., 27, 327, 1908.

Anal. — From Wheal Towan, St. Agnes, Cornwall, on crystals with cubic appearance, probably twins; Prior, Min. Mag., 13, 190.

Artif.: formed by sublimation in a furnace at Butte, Mont., analyses given; Winchell, Amer. Geol., 28, 244, 1901; Zs. Kr., 37, 80.

CHALCOSTIBITE, Min., pp. 113, 1030; App., p. 16. — Crystals from Oruro, Bolivia; Spencer, Min. Mag., 14, 322.

Chalmersite. *E. Hussak*, Centralbl. Min., 69, 1902; 332, 1906. *F. Rinne*, *ibid.*, p. 207, 1902; *Palache*, Am. J. Sc., 24, 255, 1907; Zs. Kr., 44, 14.

Orthorhombic. Axes  $a : b : c = 0.5734 : 1 : 0.9649$  (Hussak) near chalcocite. Forms:  $c$  (001),  $b$  (010),  $a$  (100),  $m$  (110),  $l$  (130),  $f$  (012),  $g$  (011),  $d$  (021),  $y$  (103),  $p$  (111),  $o$  (236),  $r$  (233),  $s$  (263),  $t$  (136),  $u$  (1.9.12). Angles:  $mm''' = 59^\circ 40'$ ,  $cp = 62^\circ 44'$ ,  $pp''' = 52^\circ 29'$ ,  $pp' = 100^\circ 54'$ .

In thin, elongated prisms, with vertical faces strongly striated; rarely tabular  $\parallel b$ . Twins common with  $m$  as tw. plane, resembling chalcocite; also contact and penetration twins probably with tw. plane  $v$  (112). Fracture conchoidal.  $H. = 3.5$ .  $G. = 4.68$ . Luster metallic. Color brass- to bronze-yellow, resembling millerite, often with iridescent tarnish. Opaque. Strongly magnetic.

Composition,  $Cu_2Fe_2S_3$  or  $Cu_2S.Fe_2S_3$ .

Analysis by G. Florence, (1) on 0.016 gr., (2) on 0.0896:

	S	Cu	Fe
Chalmersite (Palache) 1.	35.30	17.04	46.95 = 99.29
2.	35.11	22.27	43.13 = 100.51.

From the Morro Velho gold mine, Minas Geraes, Brazil, with chalcopyrite and dolomite on a limonite derived from the alteration of pyrrhotite. Named after G. Chalmers, superintendent of the mine.

CHAMOSITE, Min., p. 658. — From Thuringia, with anal; Zalinski, Jb. Min., Beil. 19, 40, 1904; Zs. Kr., 42, 602.

CHILDRENITE, Min., p. 850. — Occurrence in granite of Greifenstein near Ehrenfriedersdorf in Saxony; Kolbeck, Centralbl. Min., 333, 1908.

CHLOANTHITE, Min., p. 88. — Occurrence (with anal.) at Cobalt, Ontario; Miller, Rep. Can. Bureau Mines, Pt. 2, 1905; Zs. Kr., 43, 395.

CHLORALUMINITE, Min., p. 165. — In colorless obtuse rhombohedrons in blocks ejected from Vesuvius in April, 1906. Optically negative. High birefringence, agreeing with artificially prepared  $AlCl_3 \cdot 6H_2O$  (Dennis and Gill, Zs. f. An. Ch., 9, 340, 1895), which gave  $r \wedge r' = 125^\circ 48'$ . Lacroix, Bull. Soc. Min., 30, 254, 1907.

CHLORARGYRITE, see *Cerargyrite*.

CHLORITES, Min., pp. 643-664; App., p. 16. — Colorless chlorite from Zlatoust, Russia, description with analysis; Zemiatsenskij, Zs. Kr., 35, 357. Studies on chemical constitution of chlorite group; Dalmer, Centralbl. Min., 627, 1901.

CHLORITOID, Min., pp. 640, 1031; App., p. 16. — Occ. (with anal.), at Strettoia, Tuscany; Manasse, Proc. Soc. Tosc., Jan., 1906.

**Chlormanganokalite.** H. J. Johnston-Lavis, Nature, 74, 103, 1906; A. Lacroix, C. R., 142, 1249, 1906; Bull. Soc. Min., 30, 219, 1907; H. J. Johnston-Lavis and L. J. Spencer, Min. Mag., 15, 54, 1908.

Hexagonal-rhombohedral  $c = 0.5801$ .  $r \wedge r' = 57^\circ 36'$ . Crystals simple obtuse rhombohedra with  $r$  (101) with occasionally small truncations of  $a$  (1120). Conchoidal fracture.  $H. = 2.5$ .  $G. = 2.31$ . Vitreous luster. Color pale wine-yellow. Optically +. Double refraction very low. Mean index of refraction = 1.59 (approx.). Deliquescent.

Comp.: Probably  $4KCl \cdot MnCl_2$ .

	KCl	MnCl <sub>2</sub>	MgCl <sub>2</sub>	Na <sub>2</sub> SO <sub>4</sub>	H <sub>2</sub> O	Insol.
Anal.:	69.42	26.45	0.16	1.19	1.52	0.71 = 99.45

Occ. Found in fragmentary material ejected from Vesuvius in April, 1906.  
[Considered by Lacroix to be monoclinic, pseudo-rhombohedral.]

**Chlornatrokalite.** H. J. Johnston-Lavis, Nature, 74, 174, 1906. — See *Sylvite*.

CHLOROMELANITE, see *Jadeite*.

CHLOROPAL, Min., p. 701. — **Anal.** — Variety nontronite, from Gross-Tresny, Mähren; Kovář, [Abh. böhm. Akad. No. 15, 1, 1896]; Zs. Kr., 31, 524; from Strehlerberg near Markt Redwitz in the Fichtel Mountains, as an alteration product of an amphibolite; Stadlinger (Sitz.-Ber. phys.-med. Soc. Erlangen, 31, 1, 1899; Zs. Kr., 35, 313; from Gdossau and Pulitz, Mähren; John [Verh. geol. R.-Anst. Wien, 50, 335, 1900]; Zs. Kr., 36, 641; from Palmetto Mountains, Esmeralda Co., Nev.; Turner, Am. J. Sc., 13, 344, 1902.

CHONDROARSENITE, see under *Sarkinite*.

CHROMITE, Min., pp. 228, 1031; App., p. 17. — Occ. in meteorites with anal.; Tassin, Proc. U. S. Nat. Mus., 34, 685, 1908.

Var. *chrompicotile*. Occurs in veins in volcanic rocks on Scottie Creek, east of Mundorff, district of Lilloet, B. C.; mineral is massive, granular; velvet black;  $G. = 4.239$ . Analysis:— $Cr_2O_3$ , 55.90;  $Al_2O_3$ , 13.83;  $FeO$ , 14.64;  $MgO$ , 15.01;  $SiO_2$ , 0.60; total, 99.98. Associated with serpentine. Hoffmann, Am. J. Sc., 13, 242, 1902.

CHRYSOBERYL, Min., pp. 229, 1031. — **Cryst.** — Twins from Smaragd, Urals, in addition to the common habits of twinning show a new law with (111) as twinning plane; Jeremejew [Bull. d. l'Acad. Imp. d. Sc., St. Petersburg (V), 8, 5, 1898]; Zs. Kr., 32, 427. Crystals from Ceylon with following new forms:  $l$  (210),  $q$  (140),  $f$  (10.1.10),  $g$  (515),  $h$  (313),  $p$  (232). From measurements on these crystals following axial ratio was derived:  $a : b : c = 0.4707 : 1 : 0.5823$ . Also optically investigated; Melzer, Zs. Kr., 33, 240.

Also from Ceylon the additional new forms:  $\eta$  (113),  $\psi$  (11.20.20),  $\omega$  (7.10.8),  $\pi$  (131),  $\tau$  (277),  $Q$  (142),  $\phi$  (1.18.9); Liffa, Zs. Kr., 36, 606, 1902.

Twins from Ceylon discussed with tables of angles (after Goldschmidt) both with the usual orientation and also when (001) is made to occupy position of (010); Goldschmidt and Preiswerk, Zs. Kr., 33, 465, and Goldschmidt, *ibid.*, 468. Crystal from New York City; Moses, Am. J. Sc., 12, 104, 1901; Marschendorf in Mähren; Slavik, Zs. Kr., 39, 303.

Anal. of material found on the Rivière du Poste in the county of Maskinonge, Province of Quebec, Canada; Evans, Am. J. Sc., 19, 316, 1905.

Occ. at Veltlin, near Sondalo, Switzerland; Brugnatelli, Zs. Kr., 32, 81.



**CHRYSOCOLLA**, Min., p. 699. — Palmer found that chrysocola from Pinal County, Arizona, would lose from 12 to 20 per cent of water by drying over sulphuric acid and would regain it all and even more by allowing it to stand over water for a few hours. The loss and regaining of the water was unaccompanied by change of color. Analyses given. *Am. J. Sc.*, **16**, 45, 1903. Anal. of material from copper mine, Bena Padru, near Ozieri, Sardinia; Lovisato, *Att. Acc. Linc.*, **12**, (2), 81, 1903; from Campiglia, Tuscany; Manasse, *Proc. Soc. Tosc.*, **15**, 20, 1906.

Common in the oxidized portions of the mineral deposits at the Clifton-Morenci copper district in Arizona. It forms cryptocrystalline to microcrystalline aggregates of particles, also in fibrous and felted aggregates and in fibrous crusts; extinction parallel, birefringence strong, negative. Lindgren and Hillebrand, *Am. J. Sc.*, **18**, 453, 1904. Cf. Jannettaz, *Bull. Soc. Min.*, **9**, 211, 1886.

**CHRYSOLITE**, Min., pp. 441, 1031; App., p. 17. — **Cryst.** — Latium with new forms, *t* (230), *u* (141); Zambonini, *Zs. Kr.*, **32**, 152; *ibid.*, **34**, 227; Montefiascone, Italy, with derivation of axial ratios; Fautappiè, *Rend. Acc. Linc.*, **14**, 17, 1905; villarsite from Traversella; Colomba, *Rend. Acc. Linc.*, **15**, 636, 1906; complex crystals of fine quality from St. Jean island in the Red Sea; Michel, *Bull. Soc. Min.*, **29**, 360, 1906; also with anal. and opt. study; Couyat, *ibid.*, **31**, 344, 1908.

**Opt.** — Relation existing between optical angle and the variation in composition; Stark, *Min. Mitth.*, **23**, 451, 1904; *Zs. Kr.*, **42**, 496. Refractive indices of crystals from inclusions in augite-andesite lava from Bellenberges near Mayen; Gaubert, *Bull. Soc. Min.*, **28**, 188, 1905; optical constants of rock forming olivine; Duparc and Pearce, *ibid.*, **31**, 108, 1908.

Anal. of mineral; from Latium; Zambonini, *Zs. Kr.*, **32**, 156. Anal. and description of crystals from meteorites from Pawlodarsk; Jeremejew and Antipoff, [*Bull. Acad. Imp. d. Sc.*, St. Petersburg, **8**, 4, **9**, 1, 91, 1898], *Zs. Kr.*, **32**, 424. Anal. of material from Flysch near Višegrad in Bosnia; Schiller, *Min. Mitth.*, **24**, 315, 1905.

Effect of ammonium chloride upon; Clarke and Steiger, *U. S. G. S.*, *Bull.* **207**, 1902; *Zs. Kr.*, **38**, 697.

Occurrence in serpentine at Chester and Middlefield, Mass., with discussion of the original mineral of the "*hampshireite*" pseudomorphs, which was undoubtedly olivine, although Roe and Parsons, *Bull. Minn. Acad. Sci.*, **4**, 2, 268, 276, 1906, have assigned them to humite; Palache, *Am. J. Sc.*, **24**, 491, 1907.

Intergrowth of olivine with ilmenite in a dolerite near Homberg on the Ohm; Schwantke, *Jb. Min., Beil.-Bd.* **18**, 460, 1904; *Zs. Kr.*, **42**, 527.

**Hyalosiderite**.—Occurrence in a basic dike rock at Iron Mine Hill, Cumberland, R. I., with analysis; Johnson and Warren, *Am. J. Sc.*, **25**, 17, 1908.

**Titanolivine**.—Occurrence in the Piedmontese Alps; Boeris, *Riv. Min.*, **26**, 1901; also L. Brugnatelli, *Zs. Kr.*, **36**, 151, 1902, gives anal. and following description: Color cherry red.  $G = 3.20-3.26$ . Pleochroism strong, bright yellow to orange.  $\beta = 1.680$ .  $2V_{Na} = 57^\circ 56'$ . Opt. +. In section || (010) shows strong crossed dispersion, from which it is concluded that titanolivine is monoclinic with ax. pl.  $\perp$  (010) and  $b$  axis =  $Bx_a$ . Intergrown with olivine with (100) of olivine || to (010) of titanolivine. Alteration products of titanolivine, same as for olivine.

**CIMOLITE**, Min., p. 689. — Anal. of material from Argentiera with discussion of chemical composition; Smirnof, [*Trav. d. l. Soc. Imp. Natur. de St. Pétersbourg*, **33**, 214, 1902], *Zs. Kr.*, **39**, 625.

**CINNABAR**, Min., pp. 66, 1031; App., p. 17. — Crystals from Alsócsajó, Hungary, with following new forms: *j* (5058), *A* (8089), *X* (9098), *V* (8085), *Y* (11.0.11.4), *I* (1122); Zimányi, *Zs. Kr.*, **41**, 439; from Sonoma County, California; Sachs, *Centralbl. Min.*, **17**, 1907. Large twinned rhombohedrons from Province of Kweichow, China; Petereit, *Am. J. Sc.*, **26**, 517, 1908.

Following indices of refraction on cinnabar from Almaden determined:

$$\begin{array}{l} \text{Li; } \omega = 2.8189; \quad \epsilon = 3.1461, \quad \epsilon - \omega = 0.3272 \\ \text{H}_a; \omega = 2.8306; \quad \epsilon = 3.1615, \quad \epsilon - \omega = 0.3309 \end{array}$$

Zimányi, *Zs. Kr.*, **41**, 439.

Occ. — At Terlingua, Brewster Co., Texas; *Uni. of Texas, Min. Sur. Bull.*, **4**, 74; *Am. J. Sc.*, **14**, 464; also Hill, *ibid.*, **16**, 251, 1903; at Gratwein near Graz, Styria; Cornu, *Centralbl. Min.*, **279**, 1908.

Radioactivity of; Losanitsch, *Berichte*, **37**, 2904; *Am. J. Sc.*, **18**, 462, 1904.

Relations to metacinnabarite; Weber, *Zs. Kr.*, **44**, 231.

**CLAUDETITE**, Min., p. 199. — Anal. of material from Szomolnok; Loczka, *Zs. Kr.*, **39**, 523.

**CLIFTONITE**, Min., p. 6. — Internal structure; Davison, *Am. J. Sc.*, **13**, 467, 1902. Limited distribution in the meteoric iron found in 1884 in Youndegin, West Australia; Fletcher, *Min. Mag.*, **12**, 171.

**CLINOCHLORE**, Min., p. 644; App., p. 17. — Effects of heating upon optical character; Klein, *Ber. Ak., Berlin*, **118**, 1902.

Anal. from Paríngu; Munteanu-Morgoel, [Bull. Soc. Sc. Bukar, 9, 568, 764, 1900], Zs. Kr., 36, 653. Analysis of var. *leuchtenbergite* from Slatouster Bezirk, Russia; Zemiatschensky, Centralbl. Min., 215, 1901. From Calci and Verruca near Monti Pisani, Tuscany, and from Affaccata, Elba, with anal.; Manasse, Proc. Soc. Tosc., 15, 20, 1906.

Occurrence of *pseudophite* (Min., p. 652) in granite at Strehlerberg near Markt Redwitz in Fichtelgebirge, with anal.; Stadlinger, [Ber. phys.-med. Soc. Erlangen, 31, 1, 1899]; Zs. Kr., 35, 313.

**CLINOENSTATITE.** Name suggested by Wahl; Min. Mitth., 26, 121, 1907, for the magnesium pyroxene. Concerning its artif. formation see Allen, White, Wright and Larsen, Am. J. Sc., 27, 1-47, 1909.

CLINOHUMIT, Min., p. 535. — Description of occurrence in crystalline limestone near Kandy, Ceylon, with anal.; Coomára-Swámy, Q. J. G. Soc., 58, 399, 1902.

CLINOZOISITE, App., p. 18. — Measurements on crystals from Goslerwand gave the axial ratio:  $a : b : c = 1.5853 : 1 : 1.8117$ ;  $\beta = 64^\circ 30.4'$ ; Westergård, Zs. Kr., 42, 279.

COBALTITE, Min., p. 89; App., p. 18. — From Northern Ontario, Canada; description of crystals with anal.; DeLury, Am. J. Sc., 21, 275, 1906.

COCCINNITE, Min., p. 161. — Crust of microscopic scarlet colored crystals on specimen from Broken Hill were proved to be mercuric iodide. Crystals were evidently cubes with occasional octahedral truncations. Does not agree with previous descriptions of this mineral. Moses, Am. J. Sc., 12, 98, 1901.

COLEMANITE, Min., p. 882; App., p. 18. — Crystals from the Calico district, San Bernardino Co., Cal., described with following new forms:  $l$  (310),  $\rho$  (301),  $g$  (502),  $f$  (801),  $\phi$  (522),  $p$  (142),  $n$  (141),  $u$  (164),  $\mu$  (165),  $\eta$  (232),  $P$  ( $\bar{1}23$ ),  $w$  ( $\bar{1}82$ ),  $s$  ( $\bar{3}41$ ). The following axial ratio was derived:  $a : b : c = 0.7768 : 1 : 0.5430$ ;  $\beta = 110^\circ 7'$ . Eakle, Bull. Dept. Geol. Uni. Cal., 3, 31, 1902; Zs. Kr., 38, 691.

Occ. of var. *pandermite* in Argentina. Anal.; Buttgenbach, Am. Soc. géol. Belg., 28, 99, 1900-1901.

Artif. formation; van't Hoff, Ber. Ak. Berlin, pp. 566, 689, 1906.

COLOR in minerals; study of coloring matter in fluorite, apatite, barite, celestite, anhydrite, halite, calcite, zircon, topaz, amethyst, microcline, tourmaline; Kraatz-Koschlau and Wöhler, Min. Mitth., 18, 304, 447, 1899; Weinschenk, *ibid.*, 19, 144, 1900; Koenigsberger, *ibid.*, 148; Nabl, *ibid.*, 273; in zircon, amethyst, smoky quartz, tourmaline; Simon, Jb. Min., Beil., 26, 249-295, 1908.

COLORADOITE, Min., p. 64. — Occurs somewhat abundantly at the Kalgoorlie gold district in Western Australia. Described by L. J. Spencer, Min. Mag., 13, 274, 1903. In massive form with conchoidal fracture; rather brittle; H. = 2.5; G. = 8.07; luster metallic and color iron-black; composition HgTe as shown by the analyses 1, 2, the latter incomplete.

	Te	Hg
1.	39.38	60.95 = 100.33
2.	35.8	59.4

Also earlier mentioned by Rickard, Trans. Am. Inst. Mining Eng., 30, 708, 1900, and Simpson, Geol. Sur. W. Austr., '97-'98, 44; '98-'99, 57; the latter (quoted by Spencer) gives G. = .921 and deduces the composition Hg<sub>2</sub>Te<sub>3</sub>.

See also *Coolgardite* and *Kalgoorlite*.

Probable occurrence at Norwegian mine, Mother Lode region, Calif.; Hillebrand, Am. J. Sc., 8, 297, 1899.

COLUMBITE, Min., p. 731; App., p. 18. — Crystal from tourmaline mine near Ramona with new form  $r$  (141). Eakle, Uni. Cal. Pub., 5, 6, 87, 1907.

Occurrence (anal.) in bed of river Tschoroch, Batum, Caucasus mts.; Tschernik, [Jour. phys.-chim. Russe, 34, 684, 1892]; Zs. Kr., 39, 627. From Sonikedal near Kragerö; Milch, Jb. Min., 1, 159, 1900. Occurs in large masses, up to 600 lbs., in pegmatite with red and green tourmaline seven miles west of Cañon City, Colorado. Analysis. W. P. Headden, Proc. Col. Sc. Soc., 8, 57, 1905:

	Nb <sub>2</sub> O <sub>5</sub>	Ta <sub>2</sub> O <sub>5</sub>	WO <sub>3</sub>	SnO <sub>2</sub>	FeO	MnO	Ign.
G. = 5.661	56.48	22.12	0.45	0.11	8.07	12.45	0.15 = 99.83

Two other analyses (*ibid.*, pp. 58, 59) of material from the Black Hills, So. Dakota, agree very closely with the above. Study of crystals from southern Norway and Greenland, with new analyses by Blomstrand and a general discussion of chemical and crystallographic relations with other species; Brøgger, *Min. Süd-Nor. Granitpeg.*, 53, 1908.

Crystals of *manganotantalite* from Mt. Apatite, Maine, showed new form, *j* (320). Partial anal.; Schaller, *Am. J. Sc.*, 24, 154, 1907; *Zs. Kr.*, 44, 3.

**Conchite**, see under *Aragonite*.

**Coolgardite**. *A. Carnot*, *Bull. Soc. Min.*, 24, 357, 1901; *C. R.*, 132, 1300, 1901; *L. J. Spencer*, *Min. Mag.*, 13, 282, 1903.

Described by Carnot as a sesquiteroxide of gold, silver and mercury, essentially  $(Au, Ag, Hg)_2Te_3$  from Kalgoolie in the East Coolgardie gold field, West Australia. The material analyzed (1, 2, 3) below was massive with conchoidal fracture, rarely showing traces of cleavage; of an iron-gray or yellowish gray inclining to bronze. Analyses:

	Te	Au	Ag	Hg	Cu	Fe	Sb
1.	56.55	23.15	16.65	3.10	0.10	<i>tr.</i>	0.20 = 99.75
2.	53.70	27.75	13.60	3.70	0.25	<i>tr.</i>	0.15 = 99.15
3.	51.13	37.06	4.71	3.70	0.88	0.90	1.20 = 99.58

These analyses vary widely, and Spencer shows that the material analyzed was unquestionably far from homogeneous and that "coolgardite" is probably to be regarded, not as a distinct species, but as a mixture of coloradoite with sylvanite (1) or with calaverite (3), or both (2); petzite may also be present.

**COORONGITE**, *Min.*, p. 1019. — Anal. of material from Coorong district, South Australia, corresponded to  $C_{10}H_{12}O$ ; Cumming, [*Proc. Roy. Soc. Victoria*, 15, 134, 1903], *Zs. Kr.*, 41, 407.

**COPIAPITE**, *Min.*, p. 964. — A ferric sulphate originally described as new and named *janosite* (from Dr. János Böckh, Director of the Geol. Sur. of Hungary) is proven after considerable discussion to be identical with copiapite. H. Böckh and K. Emszt, [*Föld. Köz.*, 35, 76, 139, 1905; *ibid.*, 36, 186, 228, 404, 455]; Weinschenk, [*ibid.*, 36, 182, 224, 289, 359, 1906]; controversy reviewed, etc., by Tóborffy, [*ibid.*, 37, 122, 173, 1907]; *Zs. Kr.*, 43, 369. A yellow ferric sulphate occurring with pyrite near Leona Heights, Alameda, Cal., is referred here by Schaller (*anal.*), *Bull. G. Univ. Cal.*, 3, 214, 1903.

Artif. formation; Scharizer, *Zs. Kr.*, 43, 124.

**COPPER**, *Min.*, p. 20; *App.*, p. 19. — New structure faces on; Mügge, *Jb. Min.*, 2, 60, 1899. Occ. in diabase, São Paulo; Hussak, *Centralbl. Min.*, 333, 1906. Occ. at Flatschach near Knittelfeld; Cornu, *Centralbl. Min.*, 279, 1908; in basalts of lower Rhine; Brauns, *ibid.*, 705, 1908.

**COQUIMBITE**, *Min.*, p. 956. — A green ferric sulphate from the Redington mine, Knoxville, Cal., described by Eakle and analyzed by Schaller is perhaps a mixture of coquimbite with the iron about one-half replaced by aluminium. *Bull. G. Univ. Cal.*, 2, 322, 1901.

Artif. formation and constitutional character of its water; Scharizer, *Zs. Kr.*, 43, 113.

**Cordylite**. Barium-parisite. *G. Flink*, *Medd. om Grönland*, 14, 236, 1898; *ibid.*, 24, 42, 1901; *Böggild*, *ibid.*, 33, 101, 1906.

Hexagonal. Axis  $c = 3.3865$ .

Forms:  $c$  (0001),  $m$  (10 $\bar{1}$ 0),  $q$  (10 $\bar{1}$ 3),  $p$  (4.0 $\bar{4}$ .15),  $r$  (20 $\bar{2}$ 3),  $s$  (4043). Angle:  $cp = *46^\circ 12'$ .

In minute prisms with  $p$ , or less often  $c$ ,  $p$ ,  $q$ ; also with club-shaped termination upon a slender prism.

Cleavage  $c$ , distinct. Fracture uneven. Brittle.  $H. = 4.5$ .  $G. = 4.31$ . Luster vitreous to adamantine; on  $c$  pearly. Color pale wax-yellow and transparent when fresh but often ochre-yellow and dull by surface alteration. Birefringence negative, weak. A zonal structure is seen in sections  $\parallel c$ . Pleochroic,  $\omega =$  greenish yellow,  $\epsilon =$  brownish yellow. Refractive indices  $\omega = 1.7640$ ;  $\epsilon = 1.5762$ .

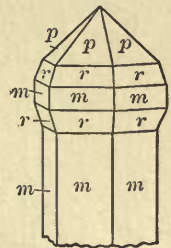
Composition, a fluocarbonate of the cerium metals and barium, cf. parisite. **Cordylite**. (*Min.*, p. 290),  $Ce_2F_2BaCeO_9$  or  $(BaF)(CeF)Ce(CO_3)_3$ . Analysis, R. Mauzelius:

$CO_2$   $ThO_2$   $Ce_2O_3$  (La,Di) $O_3$   $Y_2O_3$   $FeO$   $BaO$   $CaO$   $H_2O$   $F$  Insol.  
23.47 0.30 23.72 25.67 *tr.* 1.43 17.30 1.91 0.80 [4.87] 2.58=102.05, deduct 2.05 = 100

The material for analysis was scanty, not perfectly pure and perhaps not quite fresh.

B. B. decrepitate, becomes brown but does not fuse; moistened with hydrochloric acid colors the flame green. Easily soluble in hydrochloric acid with effervescence.

Occurs very sparingly in loose blocks and partly in pegmatite *in situ* at Narsarsuk in southern Greenland. Associated particularly with parisite, neptunite and ancylite; often implanted on *ægirite* crystals, on neptunite and on lepidolite. Named from *κορδύλη*, club, in allusion to a common form of the crystals.



**Coronadite.** *W. Lindgren and W. F. Hillebrand, Am. J. Sc., 18, 448, 1904; U. S. G. S., Bull., 262, 42, 1905; Zs. Kr., 43, 380.*

Massive, with delicate fibrous structure; in general aspect resembling psilomelane.  $H. = 4$ .  $G. = 5.246$ . Luster metallic, dull. Color black. Streak black with brownish tinge. Opaque.

Composition  $(Mn,Pb)Mn_3O_7$ , assuming the water to be due to alteration.

Analysis, *W. F. Hillebrand:*

	MnO <sub>2</sub>	PbO	MnO	ZnO	CuO	MoO <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub> *	Fe <sub>2</sub> O <sub>3</sub> †	H <sub>2</sub> O‡	Insol.	X§
(%)	56.13	26.48	6.56	0.10	0.05	0.34	0.63	1.01	1.03	7.22	0.45 = 100

\* With TiO<sub>2</sub>, P<sub>2</sub>O<sub>5</sub>, V<sub>2</sub>O<sub>5</sub> *tr.* † Oxidation undet. ‡ 0.89 above 200°. § Loss with CaO, MgO, Alk.

Occurs somewhat abundantly at the west end of the Coronado vein of the Clifton-Morenci copper district, Arizona; it is intimately mixed with quartz and is obviously of secondary origin. Named after Coronado, the explorer.

Discussion of relations to *hollandite*, with suggestion that both are manganates of the acid  $H_4MnO_6$ ; *Fermor, Rec. Geol. Sur. India, 36, 295, 1908.*

**CORUNDUM**, *Min., pp. 210, 1031; App., p. 19.* — **Cryst.** — Twin crystal of sapphire with  $(10\bar{1}0)$  as twinning plane and showing new forms; *Bowman, Min. Mag., 12, 355.* Study of the crystallographic and optical constants by *Melezer, Zs. Kr., 35, 561, 1901*, and *Ber. aus Ungarn, 19, 373, 1901*, on Burma ruby crystals, on some Ceylon crystals and on artificial ruby crystals gave for value of  $c$  axis = 1.3652. A large number of vicinal and somewhat doubtful forms in the rounded zones are given and the indices of refraction for sodium, blue and red light for crystals of different colors, are compared. Twin from Coler Fork of Cowee Creek, Macon Co., N. C.; *Hidden, Am. J. Sc., 13, 474, 1902.* Large crystals of sapphire and ruby from Australia and Ceylon; *Brauns, Centralbl. Min., 588, 1905.* Pseudomorph after corundum, Perth, Ontario; *Graham, Am. J. Sc., 22, 52, 1906.*

Anal. of ruby from Siam and Burma; *Pfeil [Inaug.-Diss., Heidelberg, 1901]; Centralbl. Min., 145, 1902.*

Occurrence of ruby at Cowee Creek, N. C., in garnet bearing basic rocks with description of crystals; *Judd and Hidden, Am. J. Sc., 8, 370, 1899; Min. Mag., 12, 139; in North Carolina in amphibole schist, Cowee township, Macon County, and in quartz schist in southwestern part of North Carolina and in northeastern part of Georgia; Pratt, Am. J. Sc., 10, 295; in western N. Carolina; Lewis, N. C. Geol. Sur., Bull. 11. In syenite rocks from Ontario, Canada; Miller, Amer. Geol., 24, 276, 1899; from Hungary; Szadeczky, Földt. Közl., 29, 296, 1899; Barkhamsted, Conn.; Emerson, Am. J. Sc., 14, 234, 1902. With dumortierite in pegmatite near Canyon City, Colo.; Finlay, Jour. Geol., 15, 479, 1907.*

Genesis; *Pratt, Am. J. Sc., 8, 227, 1899. Synthetical; G. F. H. Smith, Min. Mag., 15, 153, 1908; artif. ruby; Verneuil, C. R., 135, 791, 1902.*

**COVELLITE**, *Min., p. 68; App., p. 20.* — Study of crystals from Bor in Timoker Kreis, Servia, showed that they were pseudohexagonal through twinning and in reality were monoclinic or triclinic, probably the first. Angles:  $(001) : (111) = 50^\circ 40'$ ;  $(001) : (111) = 51^\circ 30'$ ;  $(1\bar{1}1) : (111) = 45^\circ 20'$ , from which the monoclinic constants  $a : b : c = 0.5746 : 1 : 0.6168$ ;  $\beta = 90^\circ 46'$  were derived. The more important forms are  $c$  (001),  $p$  (111),  $k$  (012),  $r$  (034),  $s$  (011),  $t$  (043),  $g$  (032),  $l$  (021),  $d$  (031),  $f$  (041),  $h$  (092),  $i$  (051),  $y$  (0.15.2),  $z$  (081),  $v$  (091),  $w$  (0.16.1); 15 other forms listed. Anal. given. *Stevanovic, Zs. Kr., 44, 349.*

Artif.; *Cornu, Jb. Min., 1, 30, 1908.*

**CRISTOBALITE**, *Min., p. 193.* — Occurrence at Mayen, Eifel, with optical study; *Gaubert, Bull. Soc. Min., 27, 242, 1904.*

**CROCIDOLITE**, *Min., p. 400.* — From Minussinsk, Siberia, with anal.; *Tschirwinsky, Centralbl. Min., 435, 1907; perhaps rhodusite (var. glaucophane, which see); Isküll, Zs. Kr., 44, 388.*

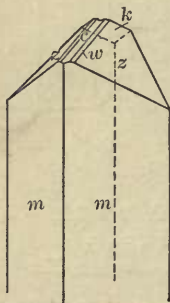
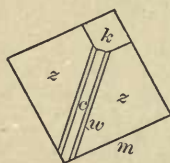
**CROCOITE**, *Min., p. 913; App., p. 20.* — Crystals from Tasmania show following new forms:  $a$  (100),  $x$  (301),  $\theta$  (331); *Moesz [Math. és term. tud. Értesítő, 17, 436, 1899]; Zs. Kr., 34, 707; f<sub>1</sub> (470); Slavik, Zs. Kr., 39, 302; J (032); Van Name, Am. J. Sc., 13, 339, 1902, (fig.); also see Anderson, Rec. Aus. Mus., 6, 141, 1906; Zs. Kr., 45, 314.*

Artif. formation; *Cesàro, Bull. Ac. Belg., 327, 1905.*

**CROSSITE**, see *Amphibole.*

**Crocoite, Tasmania**

**CRYOLITE**, *Min., pp. 166, 1032; App., p. 20.* — On heating to  $570^\circ$  changes to isotropic material and reverse change takes place on cooling; *Nacken, Centralbl. Min., 38, 1908; Cornu, ibid., 546.*



**Cryolithionite.** *N.-V. Ussing*, Overs. Dansk. Vid. Selsk. Forh., No. 1, 1904.

Isometric. In rhombic dodecahedrons, sometimes 17 cm. in diameter; faces usually rough. Cleavage dodecahedral, distinct. Fracture uneven. Brittle.  $H. = 2.5-3$ .  $G. = 2.777-2.778$ . Luster vitreous. Colorless. Perfectly transparent. Optically isotropic, indices  $n_r = 1.3382$  (Li),  $n_y = 1.3395$  (Na),  $n_{gr} = 1.3408$  (Ti).

Composition  $Li_3Na_2Al_2F_{12}$ ; or similar to a cryolite with half the sodium replaced by lithium. Analysis, Chr. Christensen:

F	Al	Na	Li	Ign.
60.79	14.46	18.83	5.35	0.36 = 99.79.

B. B. fuses even more easily than cryolite (fusibility  $710^\circ$ , for cryolite  $920^\circ$ ). In the closed tubes decrepitates violently and fuses to a colorless liquid; at a red heat decomposes, giving off fumes. Soluble in water, more readily than cryolite (1 gram in 1350 gr. water at  $18^\circ$ ).

From the cryolite deposits at Ivigtut, Greenland, where it occurs sparingly, entirely embedded in the cryolite.

The name is given in allusion to the presence of lithium and the relation to cryolite. Obtained in cubic crystals from the aqueous solution of the mineral; also obtained in crystalline condition in cooling from the fused mineral.

CUBOSILICITE, see *Quartz*.

CUMENGITE, see under *Boleite*.

CUPRITE, Min., p. 206; App., p. 21. — Artif.: — Crystals found in copper furnace at Åtvidaberg, Sweden; Strandmark, Geol. För. Förh., **24**, 80, 1902.

CUPROBINNITE. A. Weisbach, Char. Min., 1880, 42. The same as *binnite* (= *tennantite*).

CUPRODESCLOIZITE, Min., p. 787. — Occurs at Nogales, Arizona, in layers with fibrous structure, color reddish brown,  $G. = 6.176$ . Analysis. Headden, Proc. Colo. Soc., **7**, 149, 1903; Zs. Kr., **41**, 203.

$V_2O_5$	$As_2O_5$	PbO	CuO	ZnO	$H_2O$	$Fe_2O_3$	MnO	Insol.
19.01	3.84	52.95	8.51	12.45	2.65	0.20	tr.	0.35 = 99.96

Cuprogoslarite. A. F. Rogers, Kansas Univ. Q., **8**, 105, 1899. — See *Goslarite*.

CUPROSCHEELITE, Min., p. 988. — Occurs at Yeoral, N. S. W. Analysis. G. W. Card, [Rec. G. Surv. N. S. W., **5**, 121, 1897]; Zs. Kr., **31**, 202.

CYANITE, Min., p. 500; App., p. 21. — Refractive indices; Taubert, [Inaug.-Diss. Jena, 1905]; Zs. Kr., **44**, 314. Anal. from Trpin, Mähren; Kovář, [Abh. böhm. Akad., **28**, 1899]; Zs. Kr., **34**, 704; Chem. constitution of; Zulkowski, Ber. Ak. Wien, **109**, (Ib), 851, 1900; from Campolongo, Tessin; Mann, [Inaug.-Diss., Leipzig, 1904]; Zs. Kr., **42**, 664. Conversion at high temperature into sillimanite, which see.

CYLINDRITE, see under *Teallite*.

CYRTOLITE, see under *Zircon*.

DANAITE, see *Arsenopyrite*.

DANALITE, Min., pp. 435, 1032; App., p. 22. — Occurs in minute crystals on Walrus Island, James Bay, Ungava district, Northeast Territory, Canada; Hoffmann, Am. J. Sc., **11**, 151, 1901.

DANBURITE, Min., p. 490; App., p. 22. — Crystals from Takachio, Hiuga, Japan, showing the following new forms: (0.22.5), (0.31.5), (0.23.1), (0.29.1), (0.50.1), (16.0.1), (10.38.19),  $\eta$  (261),  $\epsilon$  (223),  $\gamma$  (4.1.10),  $\theta$  (5.36.8); Weber, Zs. Kr., **37**, 620; from St. Barthélemy, Val d'Aosta; Millosevich, Rend. Acc. Linc., **13**, (1), 197, 1904. Small clear crystals from Piz Casanel, in Petersthal, Switzerland; Goldschmidt, Centralbl. Min., 725, 1904; from syenite of Piz Giuf, Val Strim, Switzerland; Koenigsberger, Centralbl. Min., 377, 1905; from Obira, Bungo Province, Japan, containing 7.67 p. c. of MgO; Minerals of Japan, Wada; and description of crystals by Jimbo, Beitr. Min. Japan, **1**, 1, 1905; from Mt. Bity, Madagascar, with opt. study and anal.; Lacroix, Bull. Soc. Min., **31**, 315, 1908.

Darlingite [Trans. R. Soc. Victoria, **7**, 80, 1866; Proc. R. Soc. Victoria, **9**, 86, 1897], Min. Mag., **12**, 382, 1900. A kind of lydian stone from Victoria.

**DATOLITE**, Min., p. 502; App., p. 22. — **Cryst.** — In serpentine near Fort Point, San Francisco, (anal. by Schaller); Eakle, Bull. G. Univ. Cal., 2, 317, 1901; with thaumasite, West Paterson, N. J.; Busz, Centralbl. Min., 547, 1901; Lištic, near Beroun, Bohemia, with new form  $\mu_1$  (744); Slavik and Fišer, Centralbl. Min., 229, 1903; Ber. böhm. Ges. Wiss., 50, 1902. Scottish localities; Goodchild, [Trans. Geol. Soc. Glasgow, 12, Suppl., 1-68, 1903]; Zs. Kr., 45, 305; Pareü Cailor near Požoritto, Bukovina, Austria-Hungary; Cornu and Himmelbauer, [Mitth. Nat. Ver. Wien, 3, 9-19, 1905]; Zs. Kr., 44, 300; Buffaure, Fassathal, Austria (anal.); Tacconi, Rend. Acc. Linc., 14, (2), 705, 1905; Westfield, Mass.; Whitlock, N. Y. State Mus., Bull., 98, 19, 1905; Zs. Kr., 43, 394, with the following new forms:  $\epsilon'$  (148),  $\lambda'$  (149),  $\mu'$  (1.4.10), and by Kraus and Cook, Am. J. Sc., 22, 21, 1906, with the additional new forms,  $m_y$  (067),  $m_z$  (0.1.10),  $n_z$  (1.1.10); (anal.); Sp. G. = 3.0058. Colebrook mine, Dundas, Tasmania; Anderson, Rec. Aus. Mus., 6, 142, 1906; Zs. Kr., 45, 314.

Effect of low temperatures upon optical properties; Panichi [Mem. Acc. Linc., 4, 389, 1902]; Zs. Kr., 40, 89.

**Anal.** — From Dartmoor forest, Devonshire; Busz, Jb. Min. Beil. Bd., 13, 90; Zs. Kr., 36, 518; Derry, Ottawa Co., Quebec; Hoffmann, Am. J. Sc., 12, 447, 1901; Bergen Hill, N. J., with discussion of chem. comp.; Himmelbauer, Ber. Acad. Wien, 115, 1181, 1906.

Effect of ammonium chloride upon; Clarke and Steiger, U. S. G. S., Bull., 207, 1902; Zs. Kr., 38, 696.

Occurrence at Nobani, Hyuga Province, Japan; Wada, Minerals of Japan.

**Davidite**. Name given to a black mineral occurring in bright grains and cube-like crystals in pegmatite veins south from Olary, S. Australia. Contains more than 50%  $TiO_2$  with Fe, rare earths, U, V and Cr. H. = 4. Mawson, [Trans. Roy. Soc. S. Aus., 30, 188, 1906]; Rennie and Cooke [ibid., p. 193]; Zs. Kr., 45, 315.

**Delorenzite**. *F. Zambonini*, Zs. Kr., 45, 76, 1908.

Orthorhombic.  $\tilde{a} : \tilde{b} : \tilde{c} = 0.3375 : 1 : 0.3412$ . Angles: (010) : (110) =  $71^\circ 21'$ ; (100) : (201) =  $26^\circ 19'$ . Forms:  $a$  (100),  $b$  (010),  $m$  (110),  $g$  (130)?,  $d$  (201),  $s$  (111). Crystals usually prismatic in habit  $\parallel$  to  $\tilde{c}$  axis. Fracture sub-conchoidal. H. = 5.5-6. G. = 4.7 (approx.). Black color, in thin splinters brown. Resinous luster.

Comp. Perhaps  $2FeO \cdot UO_2 \cdot 2Y_2O_3 \cdot 24TiO_2$ ;  $TiO_2$ , 68.94;  $Y_2O_3$ , 16.21;  $UO_2$ , 9.70; FeO, 5.15.

	$TiO_2$	$SnO_2$	$UO_2^*$	$Y_2O_3$	FeO*	Total
Anal. (Šterba):	66.03	4.33	9.87	14.63	4.25 =	99.11

\* State of oxidation not determined.

Obs. Found associated with strüverite in pegmatite at Graveggia, Val Vigezzo, Piedmont. Named in honor of geologist Dr. G. DeLorenzo.

**Delorenzite** **DESCLOIZITE**, Min., p. 787; App., p. 22. — Crystals from Bena a Padru, Sardinia; Lovisato, Rend. Acc. Linc., 13, (2), 43, 1904; Broken Hill, N. W. Rhodesia, with new form (310); Spencer, Min. Mag., 15, 31, 1908; from near Saïda, Oran, Algiers; Lacroix, Bull. Soc. Min., 31, 44, 1908.

**DEWEYLITE**, Min., p. 676. — Chem. comp.; Foggy, Ber. Ak. Wien, 115, 1081, 1906; Zambonini, Mem. Acc. Sci. Napoli, 14, 84, 1908.

**DIAMOND**, Min., pp. 3, 1033; App., p. 22. — New form on crystal from East Indies (531); inclusions of potassium mica; Jeremejew, [Bull. Ac. Sc. St. Pétersbourg, 6, 1897]; Zs. Kr., 31, 508.

Electric properties of diamond; Artom, Att. Acc. Torino, 37, 667, 1902. Action of radium emanations on diamond; Crookes, Chem. News, 90, 1.

Origin of; Crookes, Nature, 72, 593, 1905.

**Occ.** — Bort crystals from Transvaal; Jeremejew, [Verh. russ. min. Ges., 36, 34, 1898], Zs. Kr., 32, 431; in gold gravel, Taiga, Jenisseisk, Russia; Jeremejew, [Bull. Ac. Sc. St. Pétersbourg, 8, 5, 1898]; Zs. Kr., 32, 427; in California; Turner, Am. Geol., 23, 182, 1899. Many rich diamond deposits have been located in South Africa recently at points far distant from those earlier developed. Here belong the group of mines of which the Premier is best known. Others occur farther north in Rhodesia, in the Somabula Forest, where the diamond, often of green tinge occurs, rather abundantly in gravels with enstatite, chrysoberyl, cyanite, sapphire, etc.; Mennell, Geol. Mag., (5), 3, 459, 1906; reported by E. David as found in the matrix near Inverell, New South Wales, Nature, 74, 550, 1906. Garnet found embedded in diamond from Wesselton mine, Kimberley, S.A.; Sutton, Nature, 75, 488, 1907. Found in masses of garnet, pyroxene and cyanite occurring as nodules in the "kimberlite" at Roberts Victor Diamond mine, Boshof, Orange River Colony, So. Africa; Corstorphine, Trans. Geol. Soc. So. Africa, 10, 65, 1907; Am. J. Sc., 25, 87, 1908. In a peridotite stock at Murfreesboro, Pike Co., Ark. The stones have been mostly found in the detritus from the stock, but one has been observed embedded in the peridotite. They average about 1 carat in weight, but one weighing  $6\frac{1}{2}$  carats was found. They vary in color from clear and color-

less to brown, yellow and almost black. The crystals are chiefly distorted hexoctahedrons, and frequently twinned. Kunz and Washington, *Am. J. Sc.*, **24**, 275, 1907; *Trans. Am. Inst. Min. Eng.*, March, 1908.

The discovery of an extensive alluvial diamond field in Luderitzbuchte, German Southwest Africa, is reported.

**Artif.** — Formed in a silicate fusion; Friedländer, [*Verh. Ver. Beförd. Gewerbfleisses*, Berlin, 1898]; *Zs. Kr.*, **33**, 490; also Hasslinger and Wolf, *Ber. Ak. Wien*, **112**, (26), 507, 1903; and Hasslinger, *Monatsh. Geol. u. Bergb.*, **23**, 817; Ludwig, *Chem. Zeit.*, **25**, 979; Crookes, *Proc. Roy. Soc.*, **76**, 458, 1905; *Chem. News*, **42**, 148; in residues obtained by exploding cordite in closed steel cylinders; Burton, *Nature*, **72**, 397, 1905. Moissan on influence of presence of S, Si and P in artif. formation, *C. R.*, **140**, 277, 1905; [*Ann. Chim. phys.*, **5**, 174, 1905]; *Zs. Kr.*, **44**, 522.

**Large diamonds.** — The "Colenso" diamond, presented to the British Museum by John Ruskin in 1887, weighs 129 $\frac{3}{4}$  carats, *Min. Mag.*, **13**, 193, 1902. The Vienna collection has a diamond weighing 82.5 carats (Vienna), presented by G. von Haas; *Min. Mitth.*, **19**, 340, 1900. The Excelsior diamond, found at Jagersfontein, South Africa, in 1903, is now known as the Jubilee. Weight = 239 carats. "Cullinan" or "Premier" diamond, found at Premier mine, Transvaal, largest yet known, weighing 3024 carats and measuring 4 by 2 $\frac{1}{2}$  by 2 inches; Hatch and Corstorphine, *Geol. Mag.*, **2**, 170, 1905; *Am. J. Sc.*, **19**, 395; this stone has been presented to the King of England by the Transvaal Government and has been cut into 9 large stones, the 4 largest weighing 516 $\frac{1}{2}$ , 309 $\frac{3}{8}$ , 92, and 62 carats respectively; and into 96 smaller brilliants; Kunz, *Century Mag.*, June, 1909.

**DIASPORE**, *Min.*, pp. 246, 1033. — Occurs in crystals (new form *d* (031)) on Övre Arö, Langesund, Norway; Flink, *Bull. G. Inst. Upsala*, **4**, 25, 1899. Crystals from Massachusetts; Cesàro, *Bull. Ac. Belg.*, 313, 1907.

**DICKINSONITE**, *Min.*, p. 809. — Probable occurrence at Bokuwka, Kielce, Russia; Glinka [*Ann. Geol. Min. Russie*, **4**, 63, 1900], *Zs. Kr.*, **37**, 412.

**DIMORPHITE**, *Min.*, p. 35. — Study by Krenner, *Zs. Kr.*, **43**, 479, of crystals of arsenic sulphide ( $As_2S_3$ ) prepared by Schuller by sublimation in vacuum showed them to be orthorhombic with  $\tilde{a} : \tilde{b} : \tilde{c} = 0.58787 : 1 : 0.88258$  with following forms: *c* (001), *p* (111), *m* (110), *d* (101), *t* (021), *b* (010), *n* (120). *Ax. pl.*  $\parallel$  (010);  $Bx_{ac} \parallel \tilde{a}$ . Axial angle measured in Toulet solution with  $n = 1.6654$  gave  $2H_a = 108^\circ 46'$ . Optically +. If orientation of type 2 of dimorphite be changed so that its  $e = m$  of artif. crystals;  $m = p$ ;  $i = d$ ;  $o^2 = t$ ;  $C = c$ ;  $B = b$ , the crystals and angles are closely identical as follows:

Artif.	Dimorphite type 2.
dd = 67° 20'	ii = 67° 15'
pm = 29° 52'	mc = 29° 40'
pc = 60° 8'	Cm = 60° 20', etc.

Type 2 of dimorphite may then be considered as a definite species.

Considered by Stenanovič, *Zs. Kr.*, **39**, 18, to be identical with orpiment, the face *e* (011) of the former being *a* (100) of the latter.

**DIOPHASE**, *Min.*, pp. 463, 1033; *App.*, p. 23. — Anal. of material from Kirghisen-Steppe gave:  $\tilde{Si}_2O_3$ , 38.25; CuO, 50.18;  $H_2O$ , 11.39;  $Fe_2O_3$ , 0.13; total, 99.95; Zambonini, *Zs. Kr.*, **34**, 229; occurs sparingly in crystals at the Stevens mines, near Garfield Gulch in the Clifton-Morenei district, Arizona; Lindgren and Hillebrand, *Am. J. Sc.*, **18**, 452, 1904; occ. and associated minerals from Mindouli, French Congo; Lacroix, *Bull. Min. Soc.*, **31**, 247, 1908. Loss of water on heating and discussion of chem. comp.; Zambonini, [*Mem. Acc. Linc.*, **5**, 344; **6**, 102, 1905]; *Zs. Kr.*, **43**, 404; *Mem. Acc. Sci. Napoli*, **14**, 44, 1908.

**DIPYRE** cf. *Missonite*.

**DITTMARITE**, *Min.*, p. 807. — In small transparent rhombic crystals from bat guano deposits near Skipton, 30 miles S. W. from Ballarat, Australia. Anal. yields formula:  $MgNH_4PO_4 \cdot 2Mg_3H_2(PO_4)_2 \cdot 8H_2O$ . Anal.:—  $P_2O_5$ , 46.51; MgO, 26.13;  $(NH_4)_2O$ , 3.94;  $H_2O$ , 23.42; total, 100.00. *Maclvor*, *Ch. News*, **85**, 181, 1902.

**DOGNAKSKAITE**, *Min.*, p. 111. — New analyses, one giving for formula  $3Cu_2S \cdot Bi_2S_3$  (*wittichenite*, *Min.*, p. 128), but a later and apparently more careful analysis (see below) gave  $Cu_2S \cdot 2Bi_2S_3$ .

	S	Bi	Cu	
Anal. (Neugebauer): G. = 6.79	17.91	71.88	10.04	= 99.83

Koehlin, *Min. Mitth.*, **24**, 117, and Neugebauer, *ibid.*, 323.

**DOLEROPHANITE**, *Min.*, p. 924. — Observed as a furnace product at Ätvidaberg in Östergötland; Strandmark, *Zs. Kr.*, **36**, 456, 1902; *Geol. För. Förh.*, **24**, 80, 1902.

**DOLOMITE**, Min., pp. 271, 1033; App., p. 23. — An exhaustive study of the mineral, chiefly from Alpine localities, with 35 analyses and frequent optical determinations, with the results that it was established that the lime content of the mineral remains constant and that only the magnesia is replaced by other oxides, and that with increase of iron oxide present the angle  $r \wedge r'$  decreases in value while the density and indices of refraction increase; Eisenhuth, Zs. Kr., **35**, 582, 1901; occurrence in Ceylon (with anal.); Grünling, Zs. Kr., **33**, 216, 1900; at Magdeburg (with anal.); Fahrenhorst, Zs. für Naturwiss., Halle, **73**, 275, 1900; chemical studies of dolomite and magnesite; Vesterberg, Bull. G. Inst. Upsala, **5**, 97, 1901; crystals from Hoboken, N. J., Rogers, Sch. Mines Q., **23**, 138, 1902; crystals from various Greenland localities; Bøggild, Min. Groenland, **147**, 1905; anal. of material from sandstone of Calafuria, Tuscany; Manasse [Att. Soc. Tosc., **21**, 159, 1905]; Zs. Kr., **43**, 496.

**DOMEYKITE**, Min., p. 44. — Mohawkite (G. A. Koenig, Am. J. Sc., **10**, 439, 1900) is a variety of domeykite ( $\text{Cu}_2\text{As}$ ) from the Mohawk mine in Keweenaw Co., Michigan, containing nickel and cobalt. Occurs massive, fine granular to compact. Artif. crystals obtained were apparently hexagonal; Koenig and Wright, Proc. Amer. Phil. Soc., **43**, 219, 1903. Color gray, with faint tinge of yellow; tarnishes easily, finally to a dull purple.  $H. = 3.5$ , brittle.  $G. = 8.07$ . Composition ( $\text{Cu}, \text{Ni}, \text{Co}$ )<sub>3</sub> As. Analysis, Koenig: As, 28.85; Cu, 61.67; Ni, 7.03; Co, 2.20; Fe, *tr.* = 99.75. Another specimen, resembling arsenopyrite, showed a much smaller amount of nickel and cobalt, viz.: As, 28.10; Cu, 67.86; (Ni, Co), 3.32 = 99.28, Am. J. Sc., **14**, 413, 1902.

Koenig also obtained (Am. J. Sc., **10**, 442, cf. also **14**, 413, 1902), for *domeykite* from the Sheldon-Columbia mine in the Keweenaw region: As, 26.14; Cu, 74.00; (Fe, Ni, Co), 0.06 = 100.20,  $G. = 7.949$ . He concludes that earlier determinations of the specific gravity are too low ( $G. = 7.2 - 7.75$ ). Synthetic experiments yielded a product having the composition  $\text{Cu}_2\text{As}$  with  $G. = 7.71$ ; also the domeykite compound,  $\text{Cu}_2\text{As}$  with  $G. = 8.05$ ; minute crystals obtained appeared to resemble arsenopyrite. See also *Whitneyite*.

Another variety of domeykite from the Mohawk mine, containing a small amount of antimony, is called by Koenig (*ibid.*, p. 445) *stibiodyomeykite*. Resembles the domeykite from the Houghton Co. mines. Occurs massive with conchoidal fracture, very brittle, less friable than mohawkite.  $H. = 4$ , or a little below.  $G. = 7.902$ . Speedily assumes a brass tarnish, finally becoming bluish purple. An analysis gave: As, 26.45; Sb, 0.78; Cu, 72.48; (Fe, Ni, Co), 0.24 = 99.95. Another sample gave 1.29 Sb. Antimony is absent from the Houghton Co. domeykite.

Artif. crystals of domeykite closely resembling chalcocite described by Stevanović, Zs. Kr., **37**, 245, 1902.

Artif. crystals also described by Koenig and Wright which were hexagonal normal with  $c = 1.539$  and showed following forms;  $c$  (0001);  $a$  (1120)?;  $b$  (1010);  $z$  (2023);  $v$  (1011);  $p$  (2021);  $x$  (112)?; also artif. crystals of argentodyomeykite and stibiodyomeykite belonging to hexagonal, normal; Koenig and Wright, Proc. Amer. Phil. Soc., **43**, 219, 1903.

Occurrence of domeykite at Flatschach near Knittelfeld, Styria; Cornu, Centralbl. Min., **277**, 1908.

**DOMINGITE**, see *Warrenite*.

**DOPPLERITE**, Min., pp. 1014, 1015. — Occurrence in the Fichtelgebirge, North Bavaria, noted; Schmidt, Centralbl. Min., **525**, 1901.

**Doughtyite**. *W. P. Headden*, Proc. Col. Sc. Soc., **8**, 55, 1905.

A deposit formed rather abundantly by the action of alkaline waters of the Doughty Springs in Colorado; it forms a white precipitate sometimes three-quarters of an inch in thickness, over an extensive surface. A sample, after drying in the air five weeks, yielded:

SO <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	ZnO	MgO	H <sub>2</sub> O	SiO <sub>2</sub>	Sand
15.00	39.51	0.45	0.44	<i>tr.</i>	41.80	1.91	1.56 = 100.67

For the above the formula  $\text{Al}_2(\text{SO}_4)_3 \cdot 5\text{Al}_2(\text{OH})_6 \cdot 21\text{H}_2\text{O}$  is calculated. Alunogen occurs at the same springs, *ibid.*, 62.

**Dubuissonite**. *C. Baret*, [Bull. Soc. Sci. Nat. de l'ouest de la France, **4**, 141, 1904]; Spencer, Min. Mag., **14**, 398, 1907. — A pink clay from near Nantes resembling montmorillonite but different in its resistance to acids and in its fusibility. Named after M. Dubuisson, mineralogist, of Nantes.

**DUFRENITE**, Min., p. 797. — Occurrence as alteration product of triplite (with anal.) at Cyrillhofer, Mähren; Kovář and Slavik, [Verh. geol. R.-Anst., Wien, **50**, 347, 1900]; Zs. Kr., **36**, 642.

**DUFRENOYSITE**, Min., p. 120; App., p. 23. — Proven by Solly to be monoclinic.  $a : b : c = 0.6509 : 1 : 0.6125$ ;  $\beta = 89^\circ 26'$ . With the new orientation (001) of vom Rath becomes (010), (100) = (001), (010) = (100) while (111) remains unchanged. Ninety-nine forms are listed, the most prominent being  $a$  (100),  $b$  (010),  $c$  (001), (101), ( $\bar{1}$ 01), (110), (530), (210), (410), (031), (052), (032), (011), (012). Angles:  $100 \wedge 110 = 33^\circ 3\frac{1}{2}'$ ,  $001 \wedge \bar{1}01 = 32^\circ 59\frac{3}{4}'$ ,  $001 \wedge 011 = 31^\circ 29\frac{1}{4}'$ ,  $100 \wedge 101 = 47^\circ 2\frac{1}{4}'$ ,  $101 \wedge 001 = 42^\circ 31\frac{1}{4}'$ ,  $010 \wedge 111 = 65^\circ 51\frac{1}{4}'$ ,  $010 \wedge 1\bar{1}\bar{1} = 66^\circ 3\frac{1}{4}'$ ,  $010 \wedge 212 = 77^\circ 22'$ .



Two types of crystals are described, (1) elongated  $\parallel a$  axis, with  $b$  prominent, (2) elongated  $\parallel b$  axis.

Cleavage:  $b$  perfect. Min. Mag., **13**, 160; Zs. Kr., **37**, 331; also Baumhauer, Zs. Kr., **38**, 649.

Analyses of material from the Binnenthal; Guillemin, [Inaug.-Diss., Breslau, 1898], Zs. Kr., **33**, 73.

DUMORTIERITE, Min., p. 558. — Analyses of material from Clip, Arizona; San Diego Co., Calif., Harlem, N. Y., by Ford, Am. J. Sc., **14**, 426, 1902; Zs. Kr., **37**, 417, 1902; and from San Diego Co., and Woodstock, Washington, by Schaller, Am. J. Sc., **19**, 211, 1905; Zs. Kr., **41**, 19, 1905. Ford considers that the boric oxide and water are basic in character and derives for the formula,  $(AlO)_{10}Al_7(SiO_4)_7$ , while Schaller finds more probable that they are present in definite proportions and gives for the formula  $8Al_2O_3 \cdot 1B_2O_3 \cdot 1H_2O \cdot 6SiO_2$ .

A partial analysis on impure material from Val Donbastone, Veltlin; Linck, Zs. f. Naturwiss., Jena, **33**, 356; Zs. Kr., **35**, 319. Color pistache green with strong pleochroism,  $a = b$ , colorless,  $c$  pistache green. Indices  $\alpha = 1.678$ ,  $\beta = 1.686$ ,  $\gamma = 1.689$ .

Occurrence with corundum, which see.

DUNDASITE, App., p. 23. — Petterd in Papers and Proc. of R. Soc. Tasmania, **18**, 1902, gives a new locality in Tasmania at Hercules mine, Mt. Read. Prior, Min. Mag., **14**, 167, describes its occurrence in Welsh Foxdale mine, near Trefriw, Carnarvonshire. Its characteristics are summarized as: occurs in white spherical aggregates or tufts of minute, radiating needles.  $H. = 2$ .  $G. = 3.25$ . Vitreous luster. Color white. Transparent. Refraction and double refraction, fairly strong: needles give parallel extinction and are positive.

Chemical formula: —  $PbO \cdot Al_2O_3 \cdot 2CO_2 \cdot 4H_2O$ ;  $PbO$ , 45.95;  $Al_2O_3$ , 21.07;  $CO_2$ , 18.14;  $H_2O$ , 14.84. I, Prior, N. Wales, loc. cit. II, Pascoe, Tasmania, loc. cit.:

	PbO	$Al_2O_3$	$Fe_2O_3$	$CO_2$	$H_2O$	Insol.	Total
I	43.20	21.39	1.61	16.45	15.01	1.80	99.46
II	41.86	26.06	5.50	28.08			101.50

DYSANALYTE, Min., p. 724. — Crystals showing cube and dodecahedron from Mte. Somma, Italy; Zambonini, Rend. Acc. Sci., Napoli, April, 1908.

DYSCRASITE, Min., p. 42; App. p. 24. — Occurrence (with anal.) at Cobalt, Ontario; Miller, Rep. Can. Bureau Mines, Pt. **2**, 1905; Zs. Kr., **43**, 395.

Ebelmenite, [Coll. Min. Mus. d'Hist. Nat., Paris, Guide du Visiteur, p. 29, 1900]; Spencer, Min. Mag., **14**, 398, 1907. A variety of psilomelane containing potassium. Named after Jacques J. Ebelmen (1814-52).

EDINGTONITE, Min., p. 599; App., p. 24. — Crystals from Kilpatrick, Scotland; Goodchild, [Trans. Geol. Soc. Glasgow, **12**, Suppl., 1-68, 1903]; Zs. Kr., **45**, 307; crystals from Böhlet, Sweden, and Kilpatrick. Indices of refraction on crystal from Böhlet, for Na light;  $\alpha = 1.5407$ ,  $\beta = 1.5529$ ,  $\gamma = 1.5556$ . Axial angle =  $49^\circ 46'$ . Sjögren, G. För., Förh., **28**, 169, 1906.

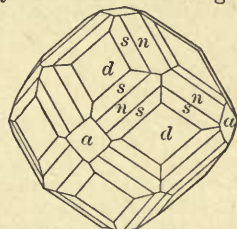
Eglestonite. A. J. Moses, Am. J. Sc., **16**, 253, 1903. [W. H. Turner, Mng. Sci. Press, July 21, 1900.] Hillebrand and Schaller, Am. J. Sc., **24**, 271, 1907.

Isometric. In minute crystals of dodecahedral habit, with also  $a$  (100),  $n$  (211) and  $s$  (321); crystals sometimes united loosely in a crust. Schaller observes twenty-one forms. Cleavage none. Fracture uneven. Brittle.  $H. = 2-3$ .  $G. = 8.327$ . Luster brilliant adamantine to resinous. Color brownish yellow to yellowish brown, darkening on exposure to sunlight and becoming finally black; powder when fresh greenish yellow to canary yellow. Transparent.

Composition; mercurous oxychloride,  $Hg_2Cl_2O$  (Hillebrand);  $Hg$ , 90.21;  $Cl$ , 7.99;  $O$ , 1.80.

Analyses 1-5 by J. S. McCord; 6-8 by Hillebrand.

	1	2	3	4	5	6	7	8
Cl	8.72	7.24	7.81	7.68	8.20	8.32	8.23	8.12
O	2.60	2.26	.....	.....	.....	1.72	1.84	1.80
Hg	88.67	90.45	90.72	88.25	89.70	88.33	88.94	89.73



Eglestonite

B. B. in the closed tube decrepitates, becomes orange-red, evolves dense white fumes and yields a white non-crystalline sublimate (chloride); finally volatilizes completely, yielding a ring of chloride and beyond a mercury mirror. Volatilizes completely on charcoal without fusion. Decomposed by  $HCl$  and  $HNO_3$  with separation of calomel.

From the mercury locality at Terlingua, Texas, with terlinguaite, montroydite, calomel, native mercury and calcite.

Named after Professor Thomas Egleston (1832-1900) of Columbia University, New York.

EKMANITE, Min., pp. 662, 1033. — Discussion of chem. comp.; Zambonini, Mem. Acc. Sci. Napoli, **14**, 30, 1908.

ELPIDITE, App., p. 24. — Crystals from Narsarsuk, Greenland; Flink, Medd. om Grönl., **14**, 230, 1898; **24**, 146, 1901; optical study. Axial angle  $2V_0 = 90^\circ 20'$ . Böggild, *ibid.*, **33**, 118, 1906.

Discussion of chem. comp.; Zambonini, Mem. Acc. Sci. Napoli, **14**, 59, 1908.

EMBOLITE, Min., p. 159. — See *Cerargyrite*.

EMMONSITE, Min., p. 979. — Possible occurrence at W. P. H. mine at Cripple Creek with analysis; Hillebrand, Am. J. Sc., **18**, 433.

EMPLECTITE, Min., p. 113. — Analyses of material from Schwarzenberg, Saxony; Guillemin, [Inaug.-Diss., Breslau, 1898], Zs. Kr., **33**, 72.

ENARGITE, Min., pp. 147, 1033; App., p. 24. — Crystals of enargite from Caudalosa, Peru, described with new forms *S* (410), *T* (430), *F* (980), *N* (230), *P* (250), *L* (270), *R* (140), *Q* (150), *D* (160), *B* (205), *M* (201), *G* (041), *H* (061), also analysis; Stevanović, Zs. Kr., **37**, 241, 1902; also crystals (with anal.) from Borin Timoker Kreis, Servia; *ibid.*, **44**, 349, 1907; from Chorolque, Bolivia; Spencer, Min. Mag., **14**, 344.

Analyses of material from San Juan County, Colorado, and Morococha, Peru; Guillemin, [Inaug.-Diss., Breslau, 1898], Zs. Kr., **33**, 77; of crystals from the Powers mine, Willis Gulch, Gilpin Co., Colorado; Headden, Proc. Col. Sc. Soc., **8**, 61, 1905.

Crystals of "luzonite" from Mancayan, Luzon, Philippine Is., occurring in cavities or on the surface of the massive mineral have been examined by Moses, Am. J. Sc., **20**, 277, 1905. They have the habit of enargite, except in the prominence of *P* (223), and show the forms: *a*, *b*, *c*, *m*, *h* (120), *l* (130), *k* (101), *s* (011),  $\theta$  (051), *P* (223); the axial ratio obtained is 0.8698 : 1 : 0.8241, which is essentially identical with that of enargite, to which it must therefore be united.

An *antimon-luzonite* occurring with stytotypite from the Caudalosa mine, Peru, has given Stevanović: ( $\frac{2}{3}$ ) *S*, 31.01; *As*, 9.09; *Sb*, 12.74; *Cu*, 45.43; *Fe*, 0.67; residue, 0.65 = 99.59; *G*. = 4.47. Zs. Kr., **37**, 239, 1902.

**Endeiolite.** *G. Flink*, Medd. om Grönland, **24**, 166, 1901.

Isometric. Only in minute octahedrons, isolated or forming crusts. Twins common, tw. pl. *o*. Cleavage none. Fracture subconchoidal to splintery. *H*. = 4. *G*. = 3.44, Mauzelius. Luster on crystal faces vitreous inclining to metallic, on the fracture greasy. Color dark chocolate-brown. Streak yellowish gray.

Composition, perhaps  $\overset{\text{II}}{\text{R}}\text{Nb}_2\text{O}_6(\text{OH})_2 \cdot \overset{\text{II}}{\text{R}}\text{SiO}_3$ . The analysis showed a loss of 11.48 p. c., assumed to be  $\text{SiO}_2$  after the analogy of *chalcoprite*. Analysis, Mauzelius:

$\text{Nb}_2\text{O}_5$	$\text{SiO}_2$	$\text{TiO}_2$	$\text{ZrO}_2$	$\text{Ce}_2\text{O}_3$	$\text{Fe}_2\text{O}_3$	$\text{MnO}$	$\text{CaO}$	$\text{K}_2\text{O}$	$\text{Na}_2\text{O}$	$\text{H}_2\text{O}$	<i>F</i>
59.93*	[11.48]	0.76	3.78	4.43	2.81	0.37	7.89	0.43	3.58	4.14	0.69 =
100.29 (less 0.29) = 100											

\* Contains  $\text{Ta}_2\text{O}_5$  in small amount.

Occurs at Narsarsuk in Southern Greenland implanted upon *ægirite* crystals; associated with *elpidite*, *leucosphenite*, *epididymite*, etc.

Named from  $\epsilon\upsilon\delta\epsilon\alpha$ , want, and  $\lambda\theta\omicron\varsigma$ , stone, in allusion to the fact that the analysis showed a considerable loss.

ENSTATITE, Min., p. 346; App., p. 24. — Clear green material from the diamond washings, South Africa, determined as enstatite. Prism angle, measured on cleavage faces, =  $88^\circ 0'$ . Plane of optic axes  $\parallel b$  (010).  $\text{Bx} \perp c$  (001).  $2V = 74^\circ 5'$ ,  $\beta = 1.669$ ,  $\gamma = 1.675$ . Dispersion  $\rho > \nu$ . Pleochroism weak; *a*, pale yellow; *b*, pale green; *c*, pale yellowish-green. Approximate analysis gave:  $\text{SiO}_2$ , 56.0;  $\text{FeO}$ , 5.0;  $\text{MnO}$ , 0.5;  $\text{Al}_2\text{O}_3$ , 2.5;  $\text{Cr}_2\text{O}_3$ , 0.6;  $\text{MgO}$ , 36.5; total 101.1. Bowman, Min. Mag., **12**, 349, 1900.

Anal. of bronzite from Flysch near Višegrad, Bosnia; Schiller, Min. Mitth., **24**, 316, 1905.

Artif. Prepared by heating a glass of composition  $\text{MgSiO}_3$  to below  $1100^\circ$ , producing enstatite in fibrous aggregates and radial spherulites. Transformed into a monoclinic variety at  $1500^\circ$ . Allen, Wright and Clement, Am. J. Sc., **22**, 385, 1906.

EPIBOULANGERITE, Min., p. 149. — Identity questioned by Guillemin; [Inaug.-Diss., Breslau, 1898], Zs. Kr., **33**, 74.

EPIDIDYMITE, App., p. 24. — Crystals from Narsarsuk, Greenland; Flink, Medd. om Grönl., **24**, 61, 1901; also, Böggild, *ibid.*, **33**, 105, 1906.

**EPIDOTE**, Min., p. 516; App., p. 25. — Crystals of large size and complex form are described from the Peacock and White Monument mines, Seven Devils mining district, Idaho; Palache, *Am. J. Sc.*, **8**, 299, 1899; association of epidote with zoisite from Mt. Pelvas, with discussion of the crystallographic and optical relations of the two minerals; Termier, *Bull. Soc. Min.*, **23**, 50, 1900; crystals from Eule, Bohemia; Barvř, *Ber. d. k. böhm. Ges. d. Wiss.*, **12**, 1901; finely crystallized specimens from Sulzer, Prince of Wales island, Alaska; Palache, *Proc. Amer. Acad.*, **37**, 531, 1902; new forms *O* (544) and *X* (322) are noted; crystals from Zöptau, Mähren; Neuwirth, *Min. Mitt.*, **22**, 584, 1903; from near Barrisdale, Inverness-shire, England; Thomas, *Min. Mag.*, **14**, 109, 1905. Anal. gave 6.81 per cent  $\text{Fe}_2\text{O}_3$ .  $\alpha = 1.714$ ,  $\beta = 1.7196$ ,  $\gamma = 1.725$ ;  $2V = 89^\circ 35'$ ; crystals from various Greenland localities; Böggild, *Min. Grönl.*, **252**, 1905; from Val di Viù, Italy, with new forms *m* (117), *n* (119), *Y* (214); also optical study; Toborffy, *Zs. Kr.*, **43**, 564, 1907; from Lyon Mt., Clinton Co., N. Y.; Whitlock, *N. Y. State Mus. Bull.*, **107**, 70, 1907; Zambonini describes crystals from Sulzbach, Tyrol, with new forms (302), (16.0.15); *Jb. Min.*, **1**, 181, 1900; from Colle del Paschietto, Ala; *Zs. Kr.*, **34**, 235, 1900; from Rocca Rossa, near Giaveno, Val Susa and several other localities with new forms and critical summary of all known forms; *ibid.*, **37**, 1, 1902, also (anal.) *ibid.*, p. 70; *Rend. Acc. Linc.*, **10**, (2), 42, 1901; from Bettolina, Vallone di Verra; *ibid.*, **12**, (2), 567, 1903; from Comba Peraegüe, Piedmont; *Centralbl. Min.*, **117**, 1903; from Chiavriè near Condove, Val Susa; *Rend. Acc. Linc.*, **15**, (2), 179, 1906. Analysis of material from Phippsburg, Maine; Hillebrand, *Clarke, Bull.* **167**, 70, U. S. G. S., 1900; *Zs. Kr.*, **36**, 79; of material from Striegau, Silesia, and Zöptau, Mähren; Pfeil, [*Inaug.-Diss.*, Heidelberg, 1901]; *Centralbl. Min.*, **144**, 1902. Rôle of water in; Zambonini, *Mem. Acc. Sci. Napoli*, **14**, 16, 1908.

**EPISTILBITE**, Min., p. 577. — Crystals from Nadap, Hungary; Mauritz, *Ann. Mus. Nat. Hung.*, **546**, 1908. Discussion of chem. comp.; Zambonini, *Mem. Acc. Sci. Napoli*, **14**, 115, 1908.

**Epistolite**. *O. B. Böggild*, *Medd. om Grönland*, **24**, 183, 1900.

Monoclinic. Axes  $a : b : c = 0.803 : 1 : 1.206$ .  $\beta = 74^\circ 42'$ . Forms: *c* (001), *m* (110), *s* ( $\bar{1}02$ ), *r* (504), *o* (011). Angles:  $cm = *78^\circ 0'$ ;  $co = 49^\circ 20'$ ;  $mm''' = 77^\circ 30'$  ( $*102^\circ 30'$  angle of prismatic traces on cleavage fragments  $\parallel c$ ). In rectangular plates, tabular  $\parallel c$ , usually enclosed in albite, rarely showing projecting edges; also in massive aggregates of curved folia.

Cleavage: *c* very perfect, yielding thin leaves; also *m* (or other face in zone *cm*) distinct. Very brittle.  $H. = 1-1.5$ .  $G. = 2.885$ .

Luster, on *c* pearly. Color white, grayish or brownish. Transparent to translucent. Optically negative; birefringence strong. Ax. pl.  $\parallel b$ .  $c \wedge a = 7^\circ$  approx. Dispersion inclined,  $v < \rho$ .  $2V = 80^\circ$  approx. Refractive index 1.67.

Composition, formula uncertain, as the mineral was partly altered.

Analysis, Chr. Christiansen:

Nb <sub>2</sub> O <sub>5</sub>	SiO <sub>2</sub>	TiO <sub>2</sub>	FeO	MnO	CaO	MgO	Na <sub>2</sub> O	H <sub>2</sub> O	F
33.56	27.59	7.22	0.20	0.30	0.77	0.13	17.59	11.01	1.98 = 100.35 (less O, 0.83) = 99.52

From the nephelite-syenite region of Julianehaab, Greenland, both on the Firth of Tunugdliarfik and of Kangerdluarsuk; it occurs partly in pegmatitic veins, partly in a massive marble-like albite, associated with sodalite, arfvedsonite, ægirite, steenstrupite, eudialyte, sphalerite, also with rinkite and polythionite.

Named from *επιστολή* letter, in allusion to the flat rectangular form and white color.

Discussion of chem. comp.; Zambonini, *Mem. Acc. Sci. Napoli*, **14**, 69, 1908.

**EPSOMITE**, Min., p. 938; App., p. 25. — Occurs crystalline near Wilcox Station, 65 miles N. of Laramie, Wyo.; Farrington, *Colum. Mus. Bull.* **1**, 228, 1900; also id. with Tillotson, *ibid.*, **3**, 7, 145, 1908. Twins on (110); Johnson, *Centralbl. Min.*, **728**, 1903.

Occurs (anal.) with pyrite near Leona Heights, Alameda Co., Cal.; Schaller, *Bull. G. Univ. Cal.*, **3**, 216, 1903. Anal. from Cripple Creek, Colo.; Hobbs, *Amer. Geol.*, **36**, 184, 1935.

**Erikite**. *O. B. Böggild*, *Medd. om Grönland*, **26**, 93, 1903.

Orthorhombic. Axes  $a : b : c = 0.57552 : 1 : 0.75796$ .

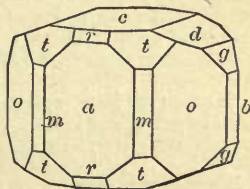
Forms: *a* (100), *b* (010), *c* (001), *m* (110), *n* (120), *o* (130), *p* (270), *r* (101), *s* (201), *d* (012), *e* (011), *f* (032), *g* (021), *h* (052), *i* (031), *u* (114), *t* (111). Angles:  $mm''' = 59^\circ 50'$ ,  $oo' = 60^\circ 10'$ ,  $bn = *40^\circ 59'$ ,  $cr = 52^\circ 47\frac{1}{2}'$ ,  $dd' = 41^\circ 31'$ ,  $gg' = 113^\circ 10'$ ,  $bf = *41^\circ 20'$ .

In prismatic crystals, *a*, *o* with *c*, nearly hexagonal in angle, also highly modified, *a* prominent; *o* faces striated vertically also *p*.

Cleavage none. Fracture uneven.  $H. = 5.5-6$ .  $G. = 3.493$ .

Color light yellowish brown to dark grayish brown, varying in the same crystal. Streak colorless. Nearly opaque. Thin sections

under the microscope show a complex structure: a network of a yellow substance of high birefringence, sometimes porous, but usually enclosing a colorless substance of lower birefringence, which last is uniaxial and positive.



Erikite.

Composition uncertain because the original mineral has obviously suffered alteration; further, it is regarded as probable that the colorless uniaxial substance seen in microscopic sections may be hydronephelite present in unknown amount and not admitting of separation. Perhaps related to britholite. Analysis:

SiO <sub>2</sub>	P <sub>2</sub> O <sub>5</sub>	ThO <sub>2</sub>	(Ce,La,Di) <sub>2</sub> O <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub>	CaO	Na <sub>2</sub> O	H <sub>2</sub> O
15.12	17.78	3.26	40.51	9.28	1.81	5.63	6.28* = 99.67
* Total, loses 1.29 at 110°.							

B. B. in the closed tube loses water and becomes white; in the forceps fuses on the edges to a white enamel. Decomposed by acids without gelatinization.

From the hill Nunarsuatiak at the Tunugdliarfikfjord in Southern Greenland where it occurs in pegmatitic veins in nephelite-syenite, associated with arvedsonite and ægirite, also analcite and natrolite; found by N. V. Ussing in 1900. The same locality has yielded steenstrupite and epistolite.

Named after Erik the Red, who discovered Greenland in 986 and after whom this fjord was formerly called Erksfjord.

**ERYTHRITE**, Min., p. 817; App., p. 25. — Occurrence at Cobalt, Ontario; Miller, Rep. Can. Bureau Mines, **2**, 1905. Refractive indices; Gaubert, Bull. Soc. Min., **30**, 107, 1907. Artif.; de Schulten, *ibid.*, **26**, 87, 1903.

**ERYTHROSIDERITE**, Min., p. 176. — Occurrence in fumaroles of eruption of April, 1906, at Vesuvius; Lacroix, Bull. Soc. Min., **30**, 252, 1907.

**Esmeraldaite**. A. S. Eakle, Bull. Geol. Univ. California, **2**, 320, 1901.

A hydrous ferric oxide from Esmeralda County, California. In small pod-shaped masses enclosed in a yellowish brown earthy and highly siliceous limonite. Fracture conchoidal. Very brittle. H. = 2.5. G. = 2.578. Luster vitreous. Color coal-black. Streak yellowish brown.

Analysis, W. T. Schaller:

Fe <sub>2</sub> O <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub>	CaO	P <sub>2</sub> O <sub>5</sub>	SiO <sub>2</sub>	H <sub>2</sub> O (110°)	H <sub>2</sub> O (above 110°)	organic
56.14	5.77	3.35	4.49	2.05	15.94	10.24	1.37 = 99.35

If only the iron and water are regarded as essential, the analysis, recalculated, yields: Fe<sub>2</sub>O<sub>3</sub>, 68.20; H<sub>2</sub>O, 31.80 = 100. This corresponds to Fe<sub>2</sub>O<sub>3</sub>·4H<sub>2</sub>O. The mineral resembles melanosiderite.

**EUCLEASE**, Min., p. 508; App., p. 25. — Crystals from near Hochnarr, Austria; Koechlin, Min. Mitth., **24**, 329, 1905; from Döbschütz near Görletz in Silesia; Kolbeck and Henglein, Centralbl. Min., **335**, 1908. Occurrence in granite at Epprechtstein in Fichtelgebirge, Bavaria; Bücking, Centralbl. Min., **425**, 1908.

**EUDIALITE**, Min., pp. 409, 1034; App., p. 25. — Crystals from Greenland with anal. by Christensen; Min. Grönl., **494**, 1905; Flink, Medd. om Grönl., **14**, 231, 1898; **24**, 90, 1901; Ussing, *ibid.*, **16**, 145, 1898.

**EUDYMYTE**, Min., p. 313. — Crystals from Narsarsuk, Greenland; Flink, Medd. om Grönl., **14**, 230, 1898; **24**, 56, 1901.

**EUXENITE**, Min., p. 744. — The supposed occurrence of an oxide of a new element in euxenite, named "euxenerde," described by Hofmann and Prandtl, with analyses of material from Arendal and Brevig, Berichte Chem. Ges., **34**, 1064. Tests for germanium in euxenite and samarskite from various localities gave only negative results; Lincio, Centralbl. Min., **142**, 1904. Anal. of material from Transvaal; Aars [Inaug.-Diss., Freiburg i. Br., 1905]; Centralbl. Min., **247**, 1907.

Probable occurrence in bed of Tschoroch river, Province Batum, Russia, with anal.; Tschernik, [Ann. Géol. Min. Russ., **5**, 196, 1902]; Zs. Kr., **39**, 625. Found at Karra akungnak, with anal. by Christensen; Böggild, Min. Grönl., **511**, 1905. Occurrence of euxenite and polycrase in southern Norway with discussion of their crystallographic and chemical relations; Brögger, Min. Süd-Nor. Granitpeg., **82**, 1908.

Radioactive euxenite (?) from Madagascar; Lacroix, Bull. Soc. Min., **31**, 312, 1908.

**EVANSITE**, Min., p. 846; App., p. 25. — Anal. of material from Gross-Tresny, Mähren; Kovár, [Abh. böhm. Akad., No. 15, 1, 1896]; Zs. Kr., **31**, 524; from Goldburg, Idaho, and coal seam west of Columbiana, Ala.; Schaller, Am. J. Sc., **24**, 155, 1907; Zs. Kr., **44**, 4.

**FAUJASITE**, Min., p. 598. — Occurrence with datolite at Daisy mica mine, Derry township, Ottawa County, Quebec; Hoffmann, Am. J. Sc., **12**, 448, 1901.

**Favas**. — Name given to various minerals occurring as rolled pebbles in the diamond sands of Brazil. Some of them consist almost entirely of TiO<sub>2</sub>, others of nearly pure ZrO; Hussak, Min. Mitth., **18**, 334; Zs. Kr., **33**, 639; Hussak and Reitingner, Zs. Kr., **37**, 566; see also *Gorceizite*.

FAYALITE, Min., pp. 456, 1034; App., p. 26. — Altered material from granulite at Villacidro, Sardinia; Lovisato, Rend. Acc. Linc., **12**, (2), 10, 1900. Occurrence in amphibole granite, quartz syenite and nepheline rocks near Wausau, Wis. Analysis given. Weidman; Jour. Geol., **12**, 551, 1904; Zs. Kr., **42**, 306. Manganiferous fayalite from Agramer Gebirge, Hungary; Kišpatić [Abh. der Südslavischen Akad., **167**, 1906]; Zs. Kr., **45**, 404.

Formed by the melting together of the andesite walls and the iron contents of an iron warehouse at St. Pierre, at the time of the eruption of Mt. Pelée, Martinique. The resulting slag consisted of a mixture of fayalite, magnetite and a little glass. In the cavities the fayalite was in isolated crystals; Lacroix, C. R., **136**, 28, 1903; Zs. Kr., **41**, 106.

FEATHER ORE, see under *Jamesonite*.

FEDOROWITE, see *Pyroxene*.

FELDSPARS, Min., pp. 314, 1034; App., p. 26. — Analyses of plagioclase from Selischtsche, Province of Wolhynien, and from Gorodischtsche, Russia, are taken to prove that the mineral is a definite compound of the albite and anorthite molecules and not an isomorphous mixture and that no exact relation exists between its chemical composition and specific gravity. Tarassenko, [Schrift. d. Naturf. Ges. Kiew, **16**, 2, 365, 1900], Zs. Kr., **36**, 182; Bull. Soc. Min., **24**, 269, 1901.

Investigations concerning the chemical constitution of the feldspars; Tschermak, Ber. Ak. Wien, **112**, 355, 1903; Zs. Kr., **41**, 508, 1905. Chemical study of potash feldspars shows constant presence of small amounts of Li and Rb in monoclinic varieties and their absence in triclinic; Barbier, Bull. Soc. Min., **31**, 152, 1908; see also Gonnard, *ibid.*, 303.

Concerning probability of a soda monoclinic feldspar; Barbier and Prost, Bull. Soc. Chim. France, **3**, 894, 1908; also Gonnard, Bull. Soc. Min., **31**, 303, 1908. Important studies by Day and Allen on the isomorphism and thermal properties of the feldspars; Publication **31**, Carnegie Institution, Washington; reprinted in part, Am. J. Sc., **19**, 93, 1905. The following mixtures of the albite and anorthite molecules were prepared and their melting points and specific gravities determined.

Melting point Sp. G.	An.	Ab,An <sub>5</sub>	Ab,An <sub>2</sub>	Ab,An <sub>1</sub>	Ab <sub>2</sub> An <sub>1</sub>	Ab <sub>3</sub> An <sub>1</sub>	Ab
	1532°	1500°	1463°	1419°	1367°	1340°	...
	2.765	2.733	2.710	2.679	2.660	2.649	2.605

Conclusions were that the soda-lime feldspars could be considered as solid solutions and form an isomorphous series. Microscopic investigation of the various products showed that those near the anorthite end of the series commonly crystallized larger than those near the albite end.

Investigations concerning the melting points, the behavior of fused masses, etc., of various silicates including the feldspars; Doelter, Ber. Ak. Wien, 1904, **113**, (1), 177, 495.

Optical. — Optical determination of the plagioclases; [Ver. d. k. russ. min. Ges. St. Petersburg, **37**, 159, 1899], Zs. Kr., **34**, 694, 1901. Optical anomalies in plagioclase; Fedorow, Zs. Kr., **31**, 579, 1899; optical orientation of oligoclase-albite; Becke, Min. Mitth., **20**, 55, 1900; of oligoclase group; Tertsch, *ibid.*, **22**, 159, 1903. Feldspars from Cala Francese, Sardinia, with study of the indices of refraction of microcline; Riva, Zs. Kr., **35**, 361, 1901; Rend. Ist. Lomb., **34**, 128, 1901; study of optical constants of twins according to pericline law; Pearce and Duparc, C. R., **133**, 60, 1901; effect of low temperatures upon optical properties of adular and sanidine; Panichi [Mem. Acc. Linc., **4**, 389, 1902]; Zs. Kr., **40**, 89. Methods of optical investigation of feldspars; Fedorow, [Ver. d. k. russ. min. Ges., **40**, 221, 1903], Zs. Kr., **39**, 605. Determination of the feldspars by means of their refractive indices; Wright, Am. J. Sc., **21**, 361, 1906; opt. study of plagioclases in thin section; Cesàro, Bull. Ac. Belg., **145**, 1907.

Study and discussion of cause of the blue reflections from moonstones ("glaukiseren"); Viola, Zs. Kr., **34**, 171, 1900.

Zonal structure in plagioclase; Fedorow, Zs. Kr., **33**, 127, 1900.

Concerning the origin of perthite; Wenglein, [Inaug.-Diss., Kiel, 1903], Zs. Kr., **41**, 680, 1905.

Laws of crystallization in eruptive rocks; Vogt, Min. Mitth., **24**, 490, 1905.

Fetid feldspar from Umberatana, S. Aus.; Mawson, [Trans. Roy. Soc. S. Aus., **30**, 67-70, 1906]; Zs. Kr., **45**, 315.

Alteration to sericite with anal.; Benedicks, Bull. Geol. Inst. Upsala, **7**, 278, 1904-1905; Zs. Kr., **43**, 641. Decomposition of; Cushman and Hubbard, U. S. Dept. of Agriculture, Bull. **28**, 1907.

Felith, see *Alith*.

FERGUSONITE, Min., p. 729; App., p. 26. — Crystals from Høgtveit, Evje, Sättersdalen, Norway; Schei, [Nyt. Mag., **43**, 137, 1905]; Zs. Kr., **43**, 638.

Mineral referred to fergusonite found in tin gravels, Embabaan district, Swaziland, S. Africa; Prior, Min. Mag., **12**, 100, 1899. Occurrence in the Caucasus, Russia, with analysis; Tschernik, [Ann. Geol. Min. Russ., **5**, 221, 1902], Zs. Kr., **39**, 625; in southern Norway with anal. by Blomstrand; Brögger, Min. Süd-Nor. Granitpeg., **31**, 1908; radioactive from Madagascar (with anal.); Lacroix, Bull. Soc. Min., **31**, 313, 1908.

**FERRONATRITE**, Min., 959.—Scharizer, Zs. Kr., **41**, 211, 1905, suggests  $[(\text{NaSO}_4)\text{Fe}]_2[\text{NaSO}_4] + 6\text{H}_2\text{O}$  (cf. *sideronatriite*) for structural formula. Prepared artificially by mixing acid ferric sulphate and acid sodium sulphate and allowing to stand for a long period in moist air. Author uses *ferrinatrite* as name for the mineral since its iron is ferric and not ferrous.

**Ferrofallidite**. R. Scharizer, Zs. Kr., **37**, 547, 1903.

A hydrated ferrous sulphate occurring with *römerite* near Copiapo in Chile. Occurs in clear grains showing double refraction.

Composition  $\text{FeSO}_4 + \text{H}_2\text{O}$ . Analysis:  $\text{SO}_3$ , 46.66;  $\text{FeO}$ , 40.94;  $\text{H}_2\text{O}$ , 10.33;  $\text{Fe}_2\text{O}_3$ , 0.92; insol. 0.87 = 99.72. Difficultly soluble in water;  $\text{H}_2\text{O}$  goes off freely only at  $230^\circ$ . The author remarks upon a possible derivation by dehydration from iron vitriol (melanterite). The compound  $\text{FeSO}_4 + \text{H}_2\text{O}$  from Chile was first noted by Mackintosh, Am. J. Sc., **38**, 245, 1839.

**Ferroermerite**. Scharizer, Zs. Kr., **37**, 546, 1903. See *roemerite*.

**FIBROFERRITE**, Min., p. 968.—Occurs thirty miles southwest of Green River, Utah; analyzed by Headden, Proc. Col. Sc. Soc., **8**, 60, 1905. Occurrence (with anal.) at Cetine, Siena, Italy; Manasse, Proc. Soc. Tosc., May, 1908.

**FICHELITE**, Min., p. 1000.—Review of previous investigations, etc.; Schmidt, Centralbl. Min., 519, 1901.

Crystals from original locality with new form *o* (110) show hemimorphism in the direction of the ortho axis. Crystal constants were calculated  $\lambda : \bar{b} : \bar{c} = 1.428 : 1 : 1.755$ ;  $\beta = 126^\circ 57'$ ; Böckh, [Föld. Köz., **34**, 335 or 369, 1904]; Zs. Kr., **44**, 70, 1907; crystals from Borkovic, Bohemia, show following new forms: *g* (101), *e* (201), *x* (304), *z* (011), *y* (114). From slightly different angles than those used above were calculated  $\lambda : \bar{b} : \bar{c} = 1.4330 : 1 : 1.7563$ ;  $\beta = 126^\circ 47\frac{1}{2}'$ . Chemical analysis gave  $c = 86.79$ ;  $H = 13.02$ ; calculated for  $\text{C}_{15}\text{H}_{32}$ ,  $C = 86.98$ ;  $H = 13.02$ . Plzák and Rosický, Zs. Kr., **44**, 332, 1907.

**FIEDLERITE**, Min., p. 172; App., p. 26.—Crystals from Laurium, Greece, with new form (150) and anal.; Lacroix and de Schulten, Bull. Soc. Min., **31**, 83, 1908.

Analysis by de Schulten, C. R., **140**, 315, 1905, leads to the formula,  $2\text{PbCl}_2 \cdot \text{Pb}(\text{OH})_2$ .

**Florencite**. E. Hussak and G. T. Prior, Min. Mag., **12**, 244, 1900; Prior, ib., p. 253.

Rhombohedral. Axis  $c = 1.15875$ ;  $0001 \wedge 10\bar{1}1 = 53^\circ 13\frac{1}{2}'$ . Observed forms: *c* (0001), *m* (1010), *r* (1011), *f* (0221). Angles  $rr' = 87^\circ 51'$ ,  $ff' = 108^\circ 26'$ . In rhombohedral crystals with *f* and *c* the prominent forms; *r* rare, *m* very rare. Faces *r*, *f* bright and smooth, *c* rough and curved.

\* This angle is stated to be given by "very good reflections" and hence is here assumed as fundamental. The author assumes the measured angle  $rr' = 88^\circ 56'$  [misprint for  $87^\circ 56'$  ?] and calculates  $c = 1.1901$  [should be 1.1913], but  $rr' = 88^\circ 56'$  requires  $108^\circ 58'$ , which is obviously wrong.

Cleavage basal, fairly perfect. Fracture splintery to sub-conchoidal. Brittle. Hardness about 5.  $G = 3.586$ . Luster greasy to resinous. Color clear pale yellow, crystals often spotted black by enclosed tourmaline, or red with iron oxide. Transparent. Optically uniaxial, positive. Birefringence not high.

Comp. A basic phosphate of aluminium and the cerium metals, closely analogous to hamlinite, to which it is related in form. Calculated formula  $\text{AlPO}_4 \cdot \text{CePO}_4 \cdot 2\text{Al}(\text{OH})_3$  or  $3\text{Al}_2\text{O}_3 \cdot \text{Ce}_2\text{O}_3 \cdot 2\text{P}_2\text{O}_5 \cdot 6\text{H}_2\text{O}$ .

Analysis, G. T. Prior, l. c.:

	$\text{P}_2\text{O}_5$	$\text{Al}_2\text{O}_3$	Ce-earths	$\text{H}_2\text{O}$	F	$\text{Fe}_2\text{O}_3$	CaO	$\text{SiO}_2$
$\frac{1}{2}$	25.61	32.28	28.00	10.87	undet.	0.76	1.31	0.48 = 99.31

Pyr. etc. Infus. Heated in C. T. gives acid water and leaves signs of etching on the tube. Only partially sol. in HCl.

A rare constituent of the cinnabar-bearing sands of Tripuhy near Ouro Preto Minas Geraes, Brazil, here associated with monazite, xenotime, lewisite, derbylite. Found more abundantly in larger crystals and rounded grains in diamond-bearing sands from "Matta dos Creoulos" near Diamantina, Minas Geraes, Brazil. Also at Morro do Caixambú near Auro Preto and Tripuhy, as a microscopic constituent of the reddish micaceous schists in the quartz lenticles of which the well known yellow topaz occurs with kaolin and hematite.

**FLUORITE**, Min., pp. 161, 1034; App., p. 26.—Crystals from Belgium localities, with following new forms, (531), (543); Buttgenbach; Ann. Soc. géol. Belg., **27**, 111, 1899–1900. Symmetry of fluorite; Beckenkamp, Zs. Kr., **34**, 605, 1901. Complex crystals from Epprechtstein in Fichtelgebirge, showing following new forms: (10.1.1), (17.1.1), (877), (931), (19.9.5); Weber, Zs. Kr.,

**37**, 433, 1903. Crystals from Gellért-Berg, Budapest, showed the new forms *j* (15.7.4) and *r* (24.10.7); Hulyák, [Földt. Közl., **33**, 54 and 175, 1903], Zs. Kr., **40**, 503, 1905; from marble of Carrara; D'Achiardi, Att. Soc. Tosc. Sc., Mem. **21**, 1905; crystals from Ivigtut, Greenland, with anal.; Böggild, Min. Greenland, 104; with new form (20.4.3) from Topčelec near Pisek, Bohemia; Křejčí, Abh. böhm. Akad., No. 2, 1905.

Determinations of index of refraction and specific gravity of specimens of different colors from different localities were practically identical. Dudenhausen, Jb. Min., **1**, 8, 1904.

Fluorescence and thermo-luminescence studied spectroscopically, also chemical examination of gaseous and liquid inclusions; it is concluded that the organic substances, to which the color is at least in part due, have nothing to do with the optical phenomena named. H. W. Morse, Amer. Acad., **41**, 587, 1906. Study of cause of phosphorescence under action of cathode rays due to presence of various rare earths. Phenomenon has been reproduced on artif. prepared material. Urbain, C. R., **143**, 825, 1906.

Experiments to determine cause of color; v. Kraatz-Koschlaw and Wöhler, Min. Mitth., **18**, 317, Zs. Kr., **33**, 632.

Fetid fluorite from Lautignié, Beaujolais; Garnier, C. R., **132**, 95, 1901.

Humphreys, Astrophys. Jour., **20**, 266; Am. J. Sc., **19**, 202, shows that many fluorites contain yttrium and frequently also ytterbium.

Occurrence at Montefano, Italy; Tacconi, Rend. Acc. Linc., **12**, (1), 355, 1903; at Heidelberg, Saxony; Bergt, Ber. Abh. Naturwiss. Ges. Isis, Dresden, **23**, 1903; Obira, Japan, with enclosed lamellæ of bismuthinite; Wada; Beitr. Min. Japan, **1**, 16, 1905; at Chacaltaya mine, Huaina Potosi, Bolivia; Spéncer, Min. Mag., **14**, 337, 1907; as cementing material in sandstone at Lauth, Königsberg, Prussia; Mügge, Centralbl. Min., **33**, 1908; used in artificial stone; Sommerfeldt, *ibid.*, 161. Occ. in natrolite-phonolite at Aussig, Baden; Rimann, Centralbl. Min., 673, 1908.

FORESITE, Min., p. 585. — Analysis of material from Elba; Manasse, [Mem. Soc. Tosc. di Sc. Nat., Pisa, **17**, 203, 1900]; Zs. Kr., **35**, 514.

FORSTERITE, Min., p. 450; App., p. 26. — Analyses of material from Albaner Mts.; Zambonini, Zs. Kr., **34**, 228; from Glenelg, Inverness-shire, Scotland; Clough and Pollard, Jour. Geol. Soc., **55**, 372, 1899; from Ceylon; Arsandaux, Bull. Soc. Min., **24**, 474, 1901; Coomára-Swámy, Jour. Geol. Soc., **58**, 399, 1902.

FRANCKEITE, see under *Teallite*.

FRANKLANDITE, Min., p. 888. — Formation discussed; van't Hoff, Ber. Ak. Berlin, 301, 1907.

FRIEDELITE, Min., pp. 465, 1035; App., p. 27. — Occurrence (with anal.) from Vielle, Val d'Aure; Lienau, Chem. Ztg., **1**, 361, 1905.

GADOLINITE, Min., pp. 509, 1035; App., p. 27. — Occurrence in large crystalline masses (one weighing 73 lbs.) from Barringer-Hill, Llano Co., Texas; Hidden, Am. J. Sc., **19**, 425, 1905. Crystals from Kumak, East Greenland; Böggild, Min. Grönl., 232, 1905.

Analyses of material from the Caucasus; Tschernik, [Jour. Soc. phys. Chim. Russe., **32**, 87, 252, 1900], Zs. Kr., **36**, 179; from West Australia; Davis, [Proc. Roy. Soc. N. S. W., **35**, 332, 1901], Zs. Kr., **39**, 178; from Idaho; Tschernik, [Jour. Soc. phys. Chim. Russe., **36**, 25, 287, 1904]; Zs. Kr., **43**, 78. Anal. by Davis from Cooglegong tin field, West Australia; Maitland, Geol. Sur. W. Aus., Bull. **23**, 65-74, 1906. Discussion of chem. comp.; Himmelbauer, Ber. Acad. Wien, **116**, 1185, 1906.

Occ. at Montefano, Italy; Tacconi, Rend. Acc. Linc., **12**, (1), 355, 1903.

GAHNITE, Min., pp. 223, 1035; App., p. 27. — Occurrence (anal.) at the Snuggen copper mines, Färila parish, Helsingland, Sweden; Hedström, G. För. Förh., **23**, 42, 1901.

GALENA, Min., p. 48; App., p. 27. — Crystals from unknown locality with new form  $\rho$  (13.1.1); Rogers, Am. J. Sc., **12**, 45, 1901; from Brosso and Traversella; Colomba, Rend. Acc. Linc., **15**, 641, 1906.

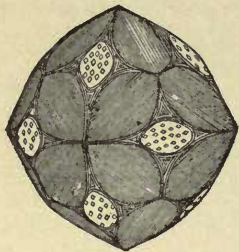
Containing 4.97 per cent Zn, from Bingham, Utah; Miers, Min. Mag., **12**, 112, 1899. Containing bismuth (anal.); Rimatori, Rend. Acc. Linc., **12**, (1), 263, 1903.

Occurrence in fumaroles of eruption of Vesuvius in April, 1906; Lacroix, Bull. Soc. Min., **30**, 229, 1907; also Zambonini, Rend. Acc. Linc., **15**, (2), 235, 1906.

GANOMALITE, Min., p. 422. — Chemical composition discussed; Penfield and Warren, see under *nasonite*; see also, Cesáro, Mem. Soc. Liège, **5**, No. 6, 23, 1904.

GANOPHYLLITE, Min., p. 564. — Its identity as a distinct species maintained; Hamberg, G. För. Förh., **26**, 81, 1904.

GARNET, Min., pp. 437, 1035; App., p. 27. — Crystals from Seven Devils District, Idaho; Palache, Am. J. Sc., 8, 300, 1899; in syenite at Biella with new form (532); Zambonini, Zs. Kr., 40, 225, 1904. Pseudomorphs of a lime alumina garnet after vesuvianite found on river Borsowka, Urals, with analysis; v. Jeremejew [Ver. k. russ. min. Gesell., 35, 11, 1897], Zs. Kr., 31, 505.



Garnet, Idaho.

2.97 per cent  $Nb_2O_5 + Ta_2O_5$ ; 5.26 per cent  $Y_2O_3$ , etc.; Tschernik [Ver. k. russ. min. Ges., 41, 1, 1903], Zs. Kr., 41, 182; from Daschkasan, Caucasus; Jaczewski, [Verh. russ. min. Ges., 42, 75, 1904], Zs. Kr., 43, 69; of manganese garnet containing 1.2%  $Y_2O_3$  from Kårarfvet near Fahlun, Sweden; Benedicks, Bull. Geol. Inst. Upsala, 7, 271, 1904-1905; Zs. Kr., 43, 640; from French Creek, Pa.; Middletown, Pa.; Sugar Hill, N. H.; Eyerman, Amer. Geol., 34, 43, 1904. Chemical and mineralogical study of various garnets, including gelatinization with acids after fusion; the effect of fusing upon specific gravity and index of refraction. Seebach, Inaug.-Diss. Heidelberg, 1906; Centralbl. Min., 774, 1906.

The alteration of pyrope, "*kelyphite*," studied optically and chemically by Mrha, Min. Mitth., 19, 111, 1899, showing that it is composed of an iron-poor bronzite or enstatite, a monoclinic pyroxene, picotite and hornblende; on the artificial alteration of garnet to epidote; v. Fedorow, [Ann. géol. et min. Russie, 8, 33, 1905]; Zs. Kr., 44, 91.

Graphitic essonite from Barkhamsted, Conn., Am. J. Sc., 14, 234, 1902.

Occurrence at Heidelberg, Saxony; Bergt, Ber. Abh. Naturwiss. Ges. Isis, Dresden, 24, 1903.

*Uvarovite*. — From Kunsjårvi, Sweden, with anal.; Borgström, Geol. För. Förh., 23, 560, 1902.

New localities in the Urals; Worobieff, [Verh. russ. min. Ges., 42, Prot. 52, 1905]; Zs. Kr., 43, 71. A brownish-yellow garnet in trachyte from Port Cygnet, Tasmania, described by Macleod and White [Proc. R. Soc. Tasmania for 1898-1899, 1900, 74]; Jour. Chem. Soc., 78, 663, and named *johnstonite* after R. M. Johnston. Anal. given.

A pink grossularite occurring in dodecahedrons in white marble at Xalostoc, Morelos, Mexico, has been called variously *landerite*, *xalostocite* and *rosolite*. See Spencer, Min. Mag., 14, 402, 1907.

GARNIERITE, Min., p. 676; App., p. 28. — Experiments concerning loss of water; Zambonini, [Mem. Acc. Linc., 5, 344; 6, 102, 1905]; Zs. Kr., 43, 401. Occurrence as alteration product in New Caledonia; Deprat, C. R., 140, 1471, 1905.

GAY-LUSSITE, Min., p. 301; App., p. 28. — Crystals from Sweetwater Valley, Wyoming; Farrington, Bull. Field Columbian Mus. Geol., Series 1, 226, 1900; Zs. Kr., 36, 77.

GEDRITE, Min., p. 384. — Crystals from Avisisarfik, Greenland, with anal. by Christensen; Böggild, Min. Grönl., 399, 1905. Occurrence (with anal.) Harcourt Township, Haliburton Co., Ontario; Evans and Bancroft, Am. J. Sc., 25, 509, 1908.

GEHLENITE, Min., p. 476; App., p. 28. — Found in granular aggregates in contact zone between limestone and diorite in Velardeña mining dist., Mexico. Anal. gave  $SiO_2$ , 26.33;  $TiO_2$ , 0.03;  $Al_2O_3$ , 27.82;  $Fe_2O_3$ , 1.43;  $FeO$ , 0.50;  $MnO$ , 0.01;  $MgO$ , 2.44;  $CaO$ , 39.55;  $Na_2O$ , 0.21;  $K_2O$ , 0.10;  $H_2O$ , 1.85; total, 100.27. Wright, Am. J. Sc., 26, 545, 1908.

GEIKIELITE, App., p. 28. — Sustschinsky has described rhombohedral crystals from Ceylon showing the forms:  $c$  (0001), also as parting,  $r$  (10 $\bar{1}$ 1) only as cleavage,  $\phi$  (5058); axis  $c = 1.370$  and  $rr' = *94^\circ 7'$  or corresponding closely with the species of the Hematite group (Min., p. 210) and pyrophanite (p. 1045);  $G = 3.976$ ; analyses by Fr. Kaepfel:

$TiO_2$	$MgO$	$Fe_2O_3$	$FeO$
60.00	29.86	6.90	2.03 = 98.79
61.32	28.95	7.75	2.03 = 100.05

Zs. Kr., 37, 57, 1902.

Analyses showing that  $FeO$  is always present in considerable amount and that the formula might better be written  $(Mg,Fe)TiO_3$ . General relations of ferromagnesian titanates discussed. Crook and Jones, Min. Mag., 14, 160, 1906.



GEOCRONITE, Min., p. 143. — Analyses, Sala, Sweden, by C. Guillemain, [Inaug.-Diss. Breslau, 1898], Zs. Kr., **33**, 75.

G. D'Achiardi has studied the crystallized mineral from Val Castello, Tuscany, Att. Soc. Tosc. Mem. **18**, 1901, and makes it isomorphous with stephanite. By changing the orientation so that (100) becomes (001) the following axial ratio, near stephanite, is obtained:  $\bar{a} : \bar{b} : \bar{c} = 0.6145 : 1 : 0.6797$ . Forms noted  $c$  (001),  $m$  (110), (058), (067), (011), (032), (021), (225), (111).

Angles (001) : (032) =  $*45^{\circ} 33\frac{1}{4}'$ ; (001) : (011) =  $34^{\circ} 12'$ . The analyses do not confirm the relation to jordanite suggested by Solly, Min. Mag., **12**, 290, 1899, but yield as formula,  $Pb_2AsSbS_3$ ,

$\frac{1}{2}$	S 17.57	Sb 7.78	As 4.47	Pb 70.02	Cu, Fe, tr. = 99.84
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Prior, Min. Mag., **13**, 186, 1902, by a new analysis of "kilbrickinite" from its original occurrence, Kilbricken Mine, County Clare, Ireland; has shown that it is identical with the earlier described geocronite from Sala, Sweden. Analysis follows:

Pb	Sb	As	S
68.49	9.13	4.59	17.20 = 99.41

**Georgiadésite.** A. Lacroix and A. de Schulten, C. R., **145**, 783, 1907; Bull. Soc. Min., **31**, 86, 1908.

Orthorhombic.  $\bar{a} : \bar{b} : \bar{c} = 0.5770 : 1 : 0.2228$ . Angles: (100) : (010) =  $119^{\circ} 59'$ ; (011) : (011) =  $154^{\circ} 53'$ . Forms; (100), (010), (011), (0.11.4), (451), (16.5.4), (4.15.2). Crystals small with hexagonal outline due to development of prism and brachypinacoid. Striated on top by oscillation of dome faces. Pyramid faces small. H. = 3.5. G. = 7.1. Resinous luster. Color white or brownish yellow. Ax. pl.  $\parallel$  (100);  $Bx_{ac} \parallel \bar{c}$ . Ax. angle large.

Comp. —  $Pb_3(AsO_4)_2 \cdot 3PbCl_2$ ;  $As_2O_5$ , 13.28; PbO, 38.61; Pb, 35.83; Cl, 12.28.

Anal. :	$As_2O_5$	PbO	Pb	Cl
	12.49	38.86	36.38	12.47 = 100.20

Obs. Found on one specimen from lead slags at Laurium, Greece, associated with fiedlerite and matlockite. Named in honor of M. Georgiadés, Director of mines at Laurium.

GERHARDTITE, Min., p. 872. — A bright green coating on the granite-porphry cliffs in Chase Creek Canyon at Metcalf, Arizona, was found to consist of a nitrate and chloride of copper; the presence of gerhardtite with atacamite is inferred. Lindgren and Hillebrand, Am. J. Sc., **18**, 460, 1904.

GIBBSITE, Min., p. 254; App., 29. — Anal. from Klein-Tresny, Mähren; Kovář Abh. böhm]. Ak., **28**, 1899; Zs. Kr., **34**, 705.

Occurs in nodular plates at Kodikanal, Palni Hills, Madras, India. Analysis agrees with accepted formula; Warth, Min. Mag., **13**, 172, 1902. Occurs with manganese-ore (pyrolusite and wad) in part radiate-fibrous, in part in minute tabular crystals at Talevadi, Bombay (anal.); also amorphous from Bhekowli, Satara distr. (anal.); L. Leigh Fermor, Rec. G. Surv. India, **34**, 167, 1906.

**Giorgiosite.** A. Lacroix, Bull. Soc. Min., **28**, 198, 1905; C. R., **140**, 1308, 1905. Saline crusts observed by Fouqué (Santorin et ses éruptions, p. 213, 1879) at the surface of lava at Alproëssa, Santorin, as a result of the eruption of 1866, have been examined by Lacroix. They consist essentially of sodium chloride, containing small quantities of carbonate, sodium sulphate and magnesium chloride. Magnesium carbonate was observed both as a fine white powder and also as a light white flocculent mass. Dried at  $100^{\circ}$  they yield water and are hence inferred to be basic carbonates of magnesium. The white powder is made up of minute radiated spherules, isolated and in groups; these yield a black cross in parallel polarized light, with a birefringence of 0.08 to 0.09, positive in the direction of the fibers. This substance is inferred to be identical with a substance obtained by Fritsche and having the composition  $4MgCO_3 \cdot Mg(OH)_2 \cdot 4H_2O$ . This imperfectly investigated mineral is called *giorgiosite* after the Giorgios.

The white flocculent mass is regarded as probably hydromagnesite.

GISMONDITE, Min., p. 586; App., p. 29. — Analyses of material from Nicolstadt near Liegnitz, Silesia, by Sachs; Centralbl. Min., 215, 1904, and from Vallerano, Capo di Bove and Mostacciano, near Rome, by Zambonini, Jb. Min., 2, 91, 1902, lead to the formula  $CaAl_2Si_2O_8 \cdot 4H_2O$ .

Occurs as alteration product (zeagonite) of nepheline from Löbau, Austria; Thugutt, Jb. Min., 2, 65, 1900.

GLASERITE = *aphthitalite*, which see.

GLAUBERITE, Min., p. 898; App., p. 29. — Crystals from Hallstatt and from Dürnberge near Hallein described by Koechlin, [Ann. Hofmus., Wien, 15, 103 and 149, 1900]; Zs. Kr., 36, 637.

Opal pseudomorphic after glauberite (?) from White Cliffs, N. S. W.; Anderson and Jevons, [Rec. Aus. Mus., 6, 31, 1905]; Min. Mag., 14, 197.

Conditions of formation discussed; van't Hoff with Chiaraviglio, Farup, d'Ans, Ber. Ak. Berlin, 810, 1899; 1000, 1903; 478, 1905; 218, 1906.

Probable occurrence in fumaroles of Mt. Pelée, Martinique; Lacroix, Bull. Soc. Min., 28, 60, 1905.

GLAUOCHROITE, App., p. 29. — Described by Penfield and Warren in Am. J. Sc., 8, 343, 1899. Optical determination gave: Ax. pl.  $\parallel c$  (001),  $Bx_a \perp b$  (010), double refraction negative;  $2E_y = 121^\circ 30'$ ,  $2V_y = 60^\circ 51'$ ; indices  $\alpha = 1.686$ ,  $\beta 1.722$ ,  $\gamma = 1.735$ . The above are near the values for monticellite deduced by Penfield and Forbes, Am. J. Sc., 50, 135, 1896.

GLAUCONITE, Min., p. 683; App., p. 29. — General study concerning; Collet and Lee, [Proc. Roy. Soc. Edinburgh, 26, 238, 1906]; Zs. Kr., 45, 302; C. R., 142, 996, 1906.

Anal. from near Grodno, Russia; Smirnoff, [Ann. Géol. Min. Russ., 7, 28, 1904]; Zs. Kr., 43, 77.

GLAUCOPHANE, Min., p. 399; App., p. 29. — Study of crystals, with analysis, from Chateyrour in Gressoney, Piedmont; Zambonini, Rend. Acc. Linc., 11, (1), 204, 1902; from New Jersey; Prather, Jour. Geol., 13, 509, 1905.

Occurrence of var. "rhodusite" from Asskys river, Minassinsk, Siberia, with analyses and discussion of chemical composition; Isküll, Zs. Kr., 44, 370, 1907.

Chemical study of glaucophane schists from many localities; Washington, Am. J. Sc., 11, 35, 1901; from Conandale Range, Queensland; Jensen, Proc. Linnæan Soc. N. S. W., 32, (1), 701, 1907; paragenesis of minerals in glaucophane rocks in California discussed by Smith, Proc. Am. Phil. Soc., 45, 183, 1906; anal. of glaucophane from rocks at Lavintzie, Bagnetal, Wallis, Switzerland; Grubenmann, Festschr. von Harry Rosenbusch, 1906, p. 1.

Glendonite. — Name suggested for calcite pseudomorphs after glauconite in various localities in N. S. Wales, after original locality of Glendon; David, Taylor, Woolnough and Foxall, [Rec. Geol. Sur. N. S. W., 8, 161, 1905]; Zs. Kr., 43, 622.

GMEINITE, Min., p. 593; App., p. 29. — Crystals from Scottish localities; Goodchild, [Trans. Geol. Soc. Glasgow, 12, Suppl., 1-68, 1903]; Zs. Kr., 45, 307.

Occurrence (with anal.) at Kurzi south of Sympheropol, Taurien, and on Commordor island, Bering Sea, Russia; Fersmann, Centralbl. Min., 573, 1906.

From Aci Castello; Di Franco, Att. Acc. Linc., 13, (1), 640, 1904.

GOLD, Min., p. 14; App., p. 29. — Crystals from Wemyi, Lena gold district, Siberia; Samoiloff, [Ver. russ. min. Gesells., 43, 237, 1905]; Zr. Kr., 44, 87; from Pralorgnan, Val d'Aosta, Italy; Millosevich, Rend. Acc. Linc., 15, (1), 320, 1906; from Brusson, Val d'Aosta; Colomba, Att. Acc. Torino, 42, 904, 1907.

Structure planes; Mügge, Jb. Min., 2, 55, 1899.

Nuggets with concentric structure, from New Guinea; Liversidge, Proc. Roy. Soc. N. S. W., 40, 161, 1906; also internal structure of some crystals, *ibid.*, 41, 143, 1907.

Gold in meteorites; Liversidge, Proc. Roy. Soc. N. S. W., Sept., 1902.

GOLDSCHMIDTITE, App., p. 30. — Shown by Palache, Zs. Kr., 34, 542, to be identical with sylvanite, (100) on goldschmidtite becoming (101) on sylvanite. The position of a number of the goldschmidtite forms was due to twinning.

Georgeixite. E. Hussak, Min. petr. Mitth., 25, 338, 1906.

Microcrystalline, in rolled pebbles.

H. = 6. G. from 3.036 to 3.123. Luster non-metallic, jasper-like on fresh fracture. Color various shades of brown and white. In thin section appears as an aggregate of small colorless irregular grains, with brown powder between. Optically uniaxial and positive. Index of refraction, 1.6253 (Gaubert, Bull. Soc. Min., 30, 108, 1907). Weak double refraction. Composition, (Ba,Ca,Ce)O.2Al<sub>2</sub>O<sub>3</sub>.P<sub>2</sub>O<sub>5</sub>.5H<sub>2</sub>O. Analyses (by G. Florence of material from Rio Abaëtè) gave:

	SiO <sub>2</sub>	Fe <sub>2</sub> O <sub>3</sub>	P <sub>2</sub> O <sub>5</sub>	Al <sub>2</sub> O <sub>3</sub>	BaO	CaO	CeO	TiO <sub>2</sub>	H <sub>2</sub> O
1.	1.55	4.10	22.74	35.00	15.42	3.55	1.55	0.67	14.62 = 99.20
1a.	....	....	22.48	37.68	16.60	3.82	1.67	....	15.74 = 100.00
2.	6.50	1.67	21.47	35.20	15.30	2.24	2.35	0.75	14.73 = 100.21
2a.	....	....	23.52	38.56	16.76	2.45	2.57	....	16.14 = 100.00

Analyses 1a and 2a are recalculated from 1 and 2 by subtracting the SiO<sub>2</sub>, Fe<sub>2</sub>O<sub>3</sub> and TiO<sub>2</sub> as impurities. Qualitative tests showed SrO in some specimens. Occurs as rounded pebbles in the diamond sands of Brazil, commonly called *favas*. Named from H. Gorceix, the first director of the School of Mines, Ouro-Preto, Minas Geraes.

GOSLARITE, Min., p. 939; App., p. 30. — *Cuprogoslarite* is a variety containing copper described by Rogers, Kansas Univ. Q., 8, 105, 1899. Occurs as a translucent light greenish blue

incrustation on the wall of an abandoned zinc mine at Galena, Cherokee, Kansas. H. = 2. On exposure to the air loses part of its water and becomes white. Analysis:

SO <sub>3</sub>	ZnO	CuO	FeO	H <sub>2</sub> O	Insol.
[27.02]	23.83	6.68	0.13	41.76	0.58 = 100

GÖTHITE, Min., pp. 247, 1036. — Crystallographic and optical studies; Cesàro and Abraham, Bull. Acad. Roy. d. Belg., 179, 1903.

**Graftonite.** S. L. Penfield, Am. J. Sc., 9, 20, 1900.

Monoclinic. Axes  $a : b : c = 0.886 : 1 : 0.582$ ;  $\beta = 66^\circ$ . Forms:  $a$  (100),  $b$  (010),  $m$  (110),  $l$  (120),  $n$  (130),  $d$  (011),  $e$  (021),  $p$  (111). Fundamental measurements only approximate;  $b \wedge d = 62^\circ$ ;  $b \wedge m = 51^\circ$ .

In rough composite crystals in which the graftonite is closely interlaminated with a pale-green triphylite, the latter usually dark from alteration. The plane of lamination is parallel to  $b$  (010) of the graftonite, the two minerals being intergrown in such a way that the macro-axis of triphylite is parallel to the clino-axis of graftonite and (102) of the former coincides with (010) of the latter.

H = 5. G. = 3.672. Luster vitreous to resinous. Color when fresh, a delicate salmon-pink, resembling lithiophilite (but usually dark from alteration).

Composition, R<sub>2</sub>P<sub>2</sub>O<sub>8</sub>, with R = Fe, Mn and Ca.

Analyses, 1, Penfield, on the fresh mineral; 2, Ford, material partly altered and oxidized:

	P <sub>2</sub> O <sub>5</sub>	Fe <sub>2</sub> O <sub>3</sub>	FeO	MnO	MgO	CaO	Li <sub>2</sub> O	Na <sub>2</sub> O	K <sub>2</sub> O	H <sub>2</sub> O
1.	41.20	...	30.65	17.62	0.40	9.23	0.33 *	...	...	0.75 = 100.18
2.	40.80	10.16	24.28	15.38	...	7.25	...	1.15	0.14	1.17 = 100.33

\* Containing some Na<sub>2</sub>O.

B. B. darkens and fuses at 2 to a slightly magnetic globule; gives a bluish green color to the flame; reacts for manganese with sodium carbonate. Readily soluble in hydrochloric acid.

From the south side of Melvin Mountain five miles west of Grafton, New Hampshire; occurs sparingly in a pegmatite vein with beryl, black tourmaline, garnet, etc.

GRAHAMITE, Min., p. 1020; App., p. 30. — From study of occurrence in Ritchie Co., W. Va., thought to be an oxidation product of petroleum; White, Bull. Geol. Soc. Amer., 10, 277, 1899; Zs. Kr. 34, 205.

**Grandidierite.** A. Lacroix, Bull. Soc. Min., 25, 85, 1902; 27, 259, 1904; C. R., 137, 582, 1903.

Orthorhombic. In anhedral elongated individuals up to 8 cm. in length; these show two cleavages in the zone of elongation,  $a$  (100) and  $b$  (010), the former more perfect.

G. = 2.99. Luster vitreous, on the cleavage surface  $a$  somewhat pearly. Color bluish green. Extinction parallel. Ax. pl.  $\parallel c$  or transverse to the direction of elongation.  $Bx_a \perp a$ . Birefringence negative. Indices (Na)  $\alpha = 1.6018$ ,  $\beta = 1.6360$ ,  $\gamma = 1.6385$ .  $2V_{Na} = 30^\circ 16'$ . Also by measurement  $2E_{Na} = 49^\circ 30'$ .  $2E_{gr} = 52^\circ$  (Tl.). Dispersion  $\rho < v$ . Strongly pleochroic, with  $\alpha > \beta > \gamma$ . In thin sections colorless in direction of elongation, blue and green transverse to this. Sections normal to an optic axis showing blue brushes on a white ground, belonging to the same type as andalusite.

Composition, a basic silicate, calculated formula  $7SiO_2, 11(Al, Fe)_2O_3, 7(Mg, Fe, Ca)O, 2(Na, K, H)_2O$ .

Analysis, Pisani:

SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	FeO	MgO	CaO	Na <sub>2</sub> O	K <sub>2</sub> O	H <sub>2</sub> O
20.90	52.80	6.60	4.86	9.65	2.10	2.22	0.40	1.25 = 100.78

B. B. infusible; unattacked by acids.

Occurs as an accessory constituent of a pegmatite and an aplite from the faults of Andrahomana, near Fort Dauphin, in the extreme southern part of Madagascar. It is associated with quartz, orthoclase and microcline, almandite, spinel, also biotite and andalusite; encloses the other rock elements in a poikilitic manner. Grandidierite is easily altered, passing into a green fibro-lamellar substance apparently related to kryptotite. Named after M. Alfred Grandidier, who has described the geography and natural history of Madagascar.

GRAPHITE, Min., pp. 7, 1036; App., p. 31. — Description of occurrences in Styria and in Ceylon; Weinschenk, [Abh. bayer. Akad. Wiss., 21, 233 and 281, 1900]; Zs. pr. Geol., 1900, 8, 36 and 174; Zs. Kr., 36, 316. In basalts of lower Rhine; Brauns, Centralbl. Min., 97, 1908.

**Greenalite.** C. K. Leith, Mon. 43, U. S. G. S., 1903.

Name given to a green hydrated ferrous silicate occurring in the form of granules in the cherty rocks associated with the iron ores of the Mesabi district, Minn. Resembles glauconite (and was originally called so) but shows no potash.

GREENOCKITE, Min., pp. 69, 1036; App., p. 31. — On calcite from Joplin, Mo.; Cornwall, Am. J. Sc., **14**, 7, 1902. Occurrence with smithsonite at Montevecchio; Lovisato, Rend. Acc. Linc., **12**, (2), 642, 1903.

GUARINITE, Min., p. 717; App., p. 31. — Discussion of chem. comp. by Zambonini; Centralbl. Min., 524 and 667, 1902. Crystals studied gave axial ratio:  $a : b : c = 0.99268 : 1 : 0.37008$ . G. between 2.9 and 3.3. Double refraction like that of quartz.  $2V = \text{near } 90^\circ$ . Axial pl.  $\parallel c$ .  $Bx_a = a$ . Strong dispersion  $\rho > v$ . Pleochroism  $a = \text{canary yellow}$ ;  $b = \text{colorless}$ ;  $c = \text{very pale yellow}$ . Axial ratio and optical properties agree closely with those of danburite.

GUMMITE, Min., p. 892; App., p. 31. — Ratio of radium to uranium; Boltwood, Am. J. Sc., **18**, 97, 1904.

GYPSUM, Min., p. 933; App., p. 31. — Cryst. — Crystals from Lebo, Coffey Co., Kansas; Rogers, Am. J. Sc., **9**, 364, 1900; from Tarajungitsok, Godhavn District, Greenland; Steenstrup, [Medd. om Grönl., **24**, 294, 1900]; from the Bad Lands, So. Dakota with (13.7.0); Rogers, Sch. Mines Q., **23**, 133, 1902; from Ballabio, with new forms (212), (313); Artini, Rend. Roy. Inst. Lomb., **36**, 1181, 1903; sand crystals; Delkeskamp, Zs. für Naturwiss., Halle, **75**, 185, 1902; crystals from dolomite limestone, Wietze, Hannover; Höfer, Ber. Ak. Wien, **113**, (I), 169, 1904; crystal from Bellisia, with (314); Cesáro, Bull. Ac. Belg., **140**, 1905; from marble of Carara; D'Achiardi, Att. Soc. Tosc. Sc., Mem., **21**, 1905; unusual crystals from salt springs at Paehpada, Jodhpur, Rajputana; Fermor, [Rec. Geol. Sur. India, **32**, 231, 1905]; Zs. Kr., **43**, 620; crystals from Igmánd, Hungary; Torborffy, Földt. Közl., **37**, 312, 1907; crystals from sulphur caves near Lomano, Siena; Manasse, Att. Soc. Tosc., **23**, 1907. Microscopic study of the crystallization of gypsum; Maschke and Vater, Zs. Kr., **33**, 57; crystals from Cetine di Cortormiano, Siena; Viola, Rend. Acc. Linc., **17**, (1), 501, 1908. Etched crystals; Wieggers, Zs. für Naturwiss., Halle, **73**, 266, 1900. Naturally etched crystals from Kommern, Bohemia; Mühlhauser, Min. Mitth., **20**, 367, 1901. Etching figures, natural and artificial, fail to show the existence of a plane of symmetry; Viola, Zs. Kr., **35**, 220, 1901.

Dispersion; König, [Ann. d. Phys., **69**, 1, 1899]; Zs. Kr., **35**, 193. Effect of low temperatures upon optical properties; Panichi, [Mem. Acc. Linc., **4**, 389, 1902]; Zs. Kr., **40**, 88.

Occ. at Cetine di Cortormiano, near Rosia, Siena; Pelloux, Rend. Acc. Linc., **10**, (2), 10, 1901; in Kansas; Grimsley and Bailey, Uni. Geol. Sur. Kansas, **5**.

Conditions of formation discussed; van't Hoff with Armstrong, Hiurchsen, Weigert, Ber. Ak. Berlin, 559, 1900; 570, 1140, 1901.

GYROLITE, Min., p. 566. Study of crystals from Niakornat and other Greenland localities by Böggild, Medd. om Grönl., **34**, 93, 1903, gave the following new facts: Crystallization rhombohedral tetartohedral. Axis  $c = 1.9360$ . Forms  $c(0001)$ ,  $r(10\bar{1}1)$ ,  $u(10\bar{1}2)$ . Angles:  $r : c = *65^\circ 54'$ ;  $u : c = 48^\circ 11'$ . Crystals small hexagonal plates, with curved faces giving inexact measurements. Crystals easily etched, figures showing tetartohedral symmetry. Cleavage per.  $\parallel c(0001)$ . Six rayed percussion fig. Optically —.  $\omega = 1.5645$ .  $\epsilon = 1.5590$ .

Anal.:  $\text{SiO}_2$ , 54.83;  $\text{Al}_2\text{O}_3$ , 4.58;  $\text{CaO}$ , 31.15;  $\text{Na}_2\text{O}$ , 1.74;  $\text{H}_2\text{O}$ , 8.14; total, 100.44.

Discussion of relations to other occurrences of gyrolite and other similar zeolites. The mineral from Niakornat has been described as a new species, *reyerite*, which see.

New occurrences in Scotland; Currie, Min. Mag., **14**, 93, 1905. Occurrence (with anal.) in diabase from Mogy-guassù, São Paulo, Brazil; Hussak, Centralbl. Min., **330**, 1906.

Thought to be identical with zeophyllite; Cornu, Centralbl. Min., **80**, 1906.

**Hackmanite.** L. H. Borgström, Geol. För. Förh., **23**, 563, 1901; Zs. Kr., **37**, 284.

Isometric; in dodecahedrons.

H. = 5. G. = 3.32 — 3.33.

Color reddish violet, becoming colorless on exposure to daylight. Transparent and isotropic. Refractive index (Na) = 1.4868.

Composition: — Member of sodalite group. It may be regarded as a sodalite with 6.23 p.c. of the "white ultramarine compound"  $\text{Na}_4[\text{Al}(\text{NaS})\text{Al}_2(\text{SiO}_4)_3$  of Brögger and Bäckström (Zs. Kr., **18**, 223, 1890).

Analysis:

	$\text{SiO}_2$	$\text{Al}_2\text{O}_3$	$\text{Fe}_2\text{O}_3$	$\text{CaO}$	$\text{Na}_2\text{O}$	$\text{K}_2\text{O}$	Cl	S
$\frac{3}{3}$	36.99	31.77	0.17	0.05	25.84	0.16	6.44	0.39 = 101.81 less O (= Cl,S) 1.64 = 100.17

Soluble in dilute hydrochloric acid with evolution of  $\text{H}_2\text{S}$  and the separation of a small amount of flocculent silica.

Occurs in the rock called tawite (W. Ramsay) from the Tawa valley in the Lujaur-Urt on the Kola peninsula, Lapland. Tawite consists of hackmanite with ægirite, also, as accessories, nephelinite, albite, microcline, eudialyte, etc. Sometimes altered on the exterior to natrolite.

Named after Dr. Victor Hackman.

HAIDINGERITE, Min., p. 827. — Artificial production; de Schulten, Bull. Soc. Min., **26**, 18, 1903; also of the corresponding barium and strontium compounds; id., *ibid.*, **27**, 104, 1904.

HALITE, Min., pp. 154, 1036; App., p. 32. — Crystals from Sicily with pseudo-rhombohedral symmetry; Andrée, Centralbl. Min., **88**, 1904. Influence of various dissolved salts on the crystal form of sodium chloride; Körbs, Zs. Kr., **43**, 451, 1906.

Determination of refractive index from Stassfurt, colorless and blue; Dudenhausen, Jb. Min., **1**, 22, 1904. Artificial dichroism of blue halite; Siedentopf, [Verh. deutsch. phys. Ges., 621, 1907]; Jb. Min., **1**, 57, 1908.

Cause of blue color; Ochsensien, Centralbl. Min., 381, 1903; Focke and Bruckmoser, Min. Mitth., **25**, 43, 1906; Cornu, Jb. Min., **1**, 32, 1908.

Analyses of occurrences in recent lavas from Vesuvius; Casoria, [Ann. R. Scuola sup. di agric. di Portici, **4**, 1, 1903]; Zs. Kr., **41**, 276; also Brauns; Centralbl. Min., 321, 1906; and Lacroix, Bull. Soc. Min., **30**, 239, 1907.

Deformation under pressure; Rinne, Jb. Min., **1**, 114, 1904.

Cubic crystals found in volcanic ash from Mt. Pelée, Martinique; Lacroix, Bull. Soc. Min., **28**, 68, 1905. Occurrence in Bilma oasis, Sahara desert; Lacroix, *ibid.*, **31**, 40, 1908.

HALLOYSITE, Min., p. 688. — Anal. from Edwards Co., Texas; var. *lenzinite* from Ventura Co., Calif.; Merrill, U. S. Nat. Mus. Rep., (2), 330, 1899; Zs. Kr., **36**, 73. Chem. constitution; McNeil, Jour. Amer. Chem. Soc., **28**, 593, 1906.

Occurs somewhat abundantly as a pink clay (anal.) at the lepidolite mine near Pala, San Diego, Cal.; Schaller, Am. J. Sc., **17**, 191, 1904.

HAMLINITE, Min., p. 762. — Suggested by Prior, Min. Mag., **12**, 249, 1900, that hamlinite florencite, plumbogummite, beudantite and svanbergite are members of one group, as follows:

		$r \wedge r'$	
Hamlinite	$2\text{SrO} \cdot 3\text{Al}_2\text{O}_3 \cdot 2\text{P}_2\text{O}_5 \cdot 7\text{H}_2\text{O}$	$87^\circ 2'$	$\frac{c}{a} = 1.1353$
Svanbergite	$2\text{SrO} \cdot 3\text{Al}_2\text{O}_3 \cdot \text{P}_2\text{O}_5 \cdot 2\text{SO}_3 \cdot 6\text{H}_2\text{O}$	$89^\circ 25'$	$\frac{c}{a} = 1.2063$
Plumbogummite	$2\text{PbO} \cdot 3\text{Al}_2\text{O}_3 \cdot 2\text{P}_2\text{O}_5 \cdot 7\text{H}_2\text{O}$	.....	.....
Beudantite	$2\text{PbO} \cdot 3\text{Fe}_2\text{O}_3 \cdot \text{P}_2\text{O}_5 \cdot 2\text{SO}_3 \cdot 6\text{H}_2\text{O}$	$88^\circ 42'$	$\frac{c}{a} = 1.1842$
Florencite	$\text{Ce}_2\text{O}_3 \cdot 3\text{Al}_2\text{O}_3 \cdot 2\text{P}_2\text{O}_5 \cdot 6\text{H}_2\text{O}$	$88^\circ 56'$	$\frac{c}{a} = 1.1901$

Identified in the diamond-bearing sands of the Serra de Congonhas, Diamantina, Brazil; Hussak, Ann. Nat. Hofmus., **19**, 93, 1904; Am. J. Sc., **19**, 202, 1905.

Material from Binnenthal, Switzerland, described originally by Solly; Nature, **71**, 118; Min. Mag., **14**, 80, 1905, as a new species and named *bowmanite*, was proven by Bowman; Min. Mag., **14**, 389, 1907, to be identical with hamlinite. Occurs in small honey-yellow crystals forming either hexagonal plates or combinations of rhombohedron and base. Some of the plates show in convergent polarized light a division into six triangular biaxial sectors, showing that the mineral is pseudo-hexagonal. Analyses given.

**Hampdenite.** Name given to serpentine occurring at Chester, Mass., enclosing serpentine pseudomorphs after olivine (*hampshirite*); Roe and Parsons, Bull. Minn. Acad. Sci., **4**, 2, 268, 276, 1906; and Palache, Am. J. Sc., **24**, 491, 1907.

**Hampshirite**, see under *Chrysolite*.

HANCOCKITE, App. I, p. 32. — Described by Penfield and Warren, Am. J. Sc., **8**, 339, 1899.

Approximate measurements, on crystals elongated  $\parallel \hat{b}$ , yielded the angles:  $ce$  (001  $\wedge$  101) =  $36^\circ 15'$ ,  $ca$  (101  $\wedge$  100) =  $30^\circ 45'$ ,  $cr$  (001  $\wedge$   $\bar{1}01$ ) =  $63^\circ$ ,  $nn'''$  ( $\bar{1}11$ )  $\wedge$  ( $11\bar{1}$ ) =  $67^\circ$ ; these are near the corresponding angles for epidote. Analyses by Warren yielded:

	$\text{SiO}_2$	$\text{Al}_2\text{O}_3$	$\text{Fe}_2\text{O}_3$	$\text{Mn}_2\text{O}_3$	$\text{PbO}$	$\text{MnO}$	$\text{MgO}$	$\text{CaO}$	$\text{SrO}$	$\text{H}_2\text{O}$
1.	30.99	17.89	( $\frac{2}{3}$ ) 12.33	1.38	( $\frac{2}{3}$ ) 18.53	2.12	0.52	<u>11.50</u>	<u>3.89</u>	1.62 = 100.77.
2.	30.88	17.99	12.96	....	17.47	2.96*	1.02	<u>15.33</u>		1.62

\*  $\text{Mn}_2\text{O}_3$  not determined.

The formula is that of epidote,  $\overset{\text{II}}{\text{R}}(\overset{\text{III}}{\text{ROH}})\overset{\text{III}}{\text{R}}_2(\text{SiO}_3)_2$ ; here  $\overset{\text{II}}{\text{R}} = \text{Pb, Ca, Sr, Mn}$  and  $\overset{\text{III}}{\text{R}} = \overset{\text{III}}{\text{Al, Fe}}$  and  $\overset{\text{III}}{\text{Mn}}$

HANNAYITE, Min., p. 832. — From guano deposits in Australia, with analysis; MacIvor, Chem. News, **85**, 181, 217, 1902.

HARDYSTONITE, App., p. 32. — Wolff has determined the indices of refraction, as follows:  $\omega_{\text{Na}} = 1.6691$ ,  $\epsilon_{\text{Na}} = 1.6568$ ;  $\omega_{\text{Li}} = 1.6758$ ,  $\epsilon_{\text{Li}} = 1.6647$ .

A new analysis gave:

SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	ZnO	MnO	CaO	MgO	K <sub>2</sub> O	Na <sub>2</sub> O	Ign.
37.78	0.91	0.43	23.38	1.26	34.22	0.26	0.78	1.10	0.34 = 100.46.

The alkalis, not shown in an earlier analysis, may be due, at least in part, to impurities. Proc. Amer. Acad., **36**, 113, 1900.

HARMOTOME, Min., p. 581; App., p. 33. — Crystals from Sarrabus, Sardinia; D'Achiardi, Mem. Soc. Tosc., **17**, 1900; from Scottish localities; Goodchild, [Trans. Geol. Soc. Glasgow, **12**, Suppl., 1-68, 1903]; Zs. Kr., **45**, 306.

**Harttite.** *E. Hussak*, Min. Mitth., **25**, 339, 1906.

Hexagonal. Occasionally in microscopic crystals with hexagonal cross section. Microcrystalline, in rolled pebbles.

H. = 4.5-5. G. = 3.21. Luster non-metallic. Color flesh-red, seldom yellow or white. In thin section appears as an aggregate of small colorless grains and crystals.

Optically uniaxial and positive.

Composition, (Sr,Ca)O.2Al<sub>2</sub>O<sub>3</sub>.P<sub>2</sub>O<sub>5</sub>.SO<sub>3</sub>.5H<sub>2</sub>O.

Analysis by G. Florence of material from Rio Sao Jose gave:

	P <sub>2</sub> O <sub>5</sub>	SO <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub>	SrO	CaO	CeO	TiO <sub>2</sub>	H <sub>2</sub> O
1.	21.17	11.53	33.36	16.80	2.80	1.02	1.42	12.53 = 100.93*
2.	21.64	11.78	34.40	17.17	2.19	....	....	12.81 = 100.00

\* Summation of anal. 1 is given by author as 100.27. Probably there is a misprint in case of percentage of CaO which should read 2.14 in order to account for CaO = 2.19 of anal. 2.

Analysis 2 is recalculated from 1 by deducting the CeO and TiO<sub>2</sub> as impurities.

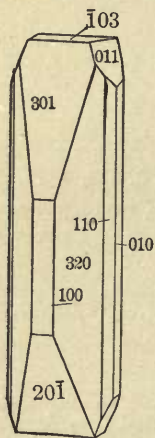
Occurs in the diamond sands of Brazil as rounded pebbles, commonly called *favas*.

Named from F. Hartt, the first director of the Geological Survey of Brazil.

HATCHETTOLITE, Min., p. 727. — Possible occurrence on Mt. Bity, Madagascar; Lacroix, Bull. Min. Soc., **31**, 246, 1908.

HAUERITE, Min., p. 87. — Belonging to tetrahedral class of isometric system; Scacchi, [Rend. Acc. Sci. Napoli, **5**, 164, 1899]; Zs. Kr., **34**, 294. Crystals from Raddusa with new form,  $\beta$  (477); Goldschmidt and Schröder, Zs. Kr., **45**, 214, 1908.

Chemical reactions between hauerite and metals at ordinary temperatures; Strüver, Centralbl. Min., **257**, 1901; Rend. Acc. Linc., **10**, (1), 124, 1901; study continued with reactions between iron sulphides and various metals; id., Centralbl. Min., **401**, 1901; action of potassium chlorate upon; Spezia, Att. Acc. Torino, **43**, April, 1908.



Hellandite

HAUSMANNITE, Min., pp. 230, 1036; App., p. 33. — Crystals from Brazil; Koechlin, Min. Mitth., **27**, 260, 1908.

HAÜYNITE, Min., p. 431; App., p. 33. — Variation of refractive indices with variation in composition; Gaubert, Bull. Soc. Min., **28**, 188, 1905.

HAYESINE, see *Bechilite*.

**Hellandite.** *W. C. Brögger*, [Nyt Mag. f. Naturv, Christiania, **41**, 213, 1903]; Zs. Kr., **42**, 417, 1906.

Monoclinic. Axes  $a : b : c = 2.0646 : 1 : 2.1570$ ;  $\beta = 109^\circ 45'$ . Forms:  $a$  (100),  $b$  (010),  $c$  (001);  $m$  (110),  $l$  (120),  $g$  (540),  $n$  (320),  $x$  ( $\bar{1}01$ ),  $d$  ( $\bar{1}02$ ),  $r$  ( $\bar{1}03$ ),  $t$  (205),  $e$  (201),  $q$  (301),  $o$  (011),  $p$  ( $\bar{1}22$ ). Angles  $mm'''' = 125^\circ 32'$ ,  $nb = * 37^\circ 40'$ ,  $ea' = * 28^\circ 20'$ ,  $a'a'' = * 39^\circ 30'$ .

Crystals are prismatic in habit, being elongated parallel to  $\bar{c}$  axis. Twins, tw. pl. (1)  $c$ , in contact twins, (2)  $a$ , shown by twinning striations and lamellæ, best seen in the thin sections.

H. = 5.5. G. = 3.70. Color nut brown to brownish red.

Optically +. Ax. pl.  $\perp$  b.  $c$  inclined  $43^\circ$  to  $\bar{c}$  in acute angle  $\beta$ . Axial angle about  $80^\circ$ . Birefringence about 0.01.

Composition,  $2\text{R}^{\text{II}}\text{O}.3\text{R}^{\text{III}}\text{O}_3.4\text{SiO}_2.3\text{H}_2\text{O}$  or either  $\text{Ca}_2\text{R}_3(\text{R}(\text{OH})_2)_2(\text{SiO}_4)_4$  or  $\text{Ca}_2(\text{R}(\text{OH})_6)(\text{SiO}_4)_4$ ,  
 $\text{R}^{\text{II}} = \text{Ca}$  chiefly;  $\text{R}^{\text{III}} = \text{Al, Fe, Mn, and the cerium metals}$ .

Analyses, 1, O. N. Heidenreich; 2, L. Andersen-Aars.

	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	Mn <sub>2</sub> O <sub>3</sub>	Ce <sub>2</sub> O <sub>3</sub>	Y <sub>2</sub> O <sub>3</sub>	Er <sub>2</sub> O <sub>3</sub>	ThO <sub>2</sub>	CaO	MgO	Na <sub>2</sub> O	K <sub>2</sub> O	H <sub>2</sub> O
1.	23.55	10.22	2.64	5.69	40.12			10.05	...	0.26	0.06	7.55	= 100.14
2.	23.66	10.12	2.56	5.91	1.01	19.29	15.43	0.62	9.81	0.10	0.23	0.06	11.75 * = 100.55

\* 6.00 p. c. by heating up to 500°, the remainder at red heat. 5.00 p. c. therefore of the water content was considered constitutional and the rest as due to alteration.

Fuses in the Bunsen burner flame. Easily soluble in HCl.

Found in pegmatite veins near Kragerö, Norway, associated with tourmaline, apatite, titanite, phenacite, thorite, and allanite.

Alters readily, chiefly by taking on more water, into a yellow or white earthy material. Pseudomorphs of microcline after hellandite were observed.

HEMATITE, Min., pp. 213, 1037; App., p. 34. — Study of crystals from various localities gave  $\epsilon$  axis = 1.3654 as an average; Melzer, Zs. Kr., **37**, 580, 1903; crystals from Ætna; Franco, Att. Acc. Gioenia, Catania, **17**, 1, 1903; from Binenthal, Switzerland; Harre, Zs. Kr., **42**, 280; from Minas Geraes, Brazil, showing rare scalenohedron (6287) and new one (1344); Dufet, Bull. Min. Soc., **26**, 60, 1903; prismatic crystals from Guanajuato, Mexico; McKee, Am. J. Sc., **17**, 241, 1904; crystals from Aosta, Italy (titaniferous); Millosevich, Rend. Acc. Linc., **15**, (1), 321, 1906; from Padru, Sardinia; Millosevich, *ibid.*, **16**, (1), 632, 1907; artif. crystals; Munroe, Am. J. Sc., **24**, 485, 1907; crystals from Vesuvius (eruption of April, 1906); Johnston-Lavis and Spencer, Min. Mag., **15**, 60, 1908; from Kakuk Mts., Hungary, with new form, *j* (4371); Zimányi, Centralbl. Min., **3**, 1908.

Optical constants; Försterling, Jb. Min., Beil., **25**, 344, 1908.

Eisenrose from St. Gotthard giving black streak; Hogenraad, Zs. Kr., **39**, 396. Parting on hematite from Franklin Furnace, N. J.; Moses, Am. J. Sc., **20**, 283. Law of parallel growth with rutile, which see. Study of magnetic properties; Westman, [Upsala Uni. Arsskrift, **2**, 1896]; Zs. Kr., **31**, 309; Abt, [Ann. d. Phys., **67**, 474, 1899]; Zr. Ks., **35**, 191; Kunz, Jb. Min., **1**, 62, 1907.

HERCYNITE, Min., p. 223; App., p. 34. — Occurs in masses in the tin drift, Moorina, Tasmania; Petterd (anal. by Millen), Notes on Tasmanian Minerals, priv. publ., John Vail, Gov't printer, Tasmania.

HERDERITE, Min., p. 760; App., p. 34. — Crystals from Epprechtstein, Fichtelgebirge, Bavaria; Bücking, Centralbl. Min., 294, 1908.

HERSCHELITE, see *Chabazite*.

HESSENBERGITE, Min., p. 1037. — By comparison of crystal angles, etc., the identity of hessenbergite (sideroxene) with *bertrandite* is strongly suggested. Grünling, Zs. Kr., **39**, 386.

HESSITE, Min., pp. 47, 1037; App., p. 35. — Crystals from Boulder Co., Colo.; Palache, Am. J. Sc., **10**, 426, 1900; Zs. Kr., **34**, 547.

Anal. of material from San Sebastian, Jalisco, Mexico; Hillebrand, Am. J. Sc., **8**, 298, 1899.

HETEROMORPHITE, see under *Plagionite*.

HEULANDITE, Min., p. 574; App. p. 35. — Cryst. — Crystals from Iceland; Jeremejew, [Bull. Acad. Sc. St. Pétersbourg, **9**, 5, 1898]; Zs. Kr., **32**, 428; from granite of Bavaria with opt. study; Artini, Rend. Acc. Linc., **11**, (2), 364, 1902; from Scottish localities with following new forms, *d* (101), *w* (032), *n* (111). Mineral considered to be triclinic pseudo-monoclinic. Goodchild, [Trans. Geol. Soc., Glasgow, **12**, Suppl., 1-68, 1903]; Zs. Kr., **45**, 306; from Petersdorf, near Zöptau, Mähren; Kretschner, Centralbl. Min., 612, 1905; from East Greenland with new form *r* (501) (Henry Glacier); Böggrid, Medd. om Grönl., **28**, 120, 1905; from Werris Creek, N. S. W.; Anderson, Rec. Aus. Mus., **6**, 422, 1907; from Nadap, Hungary, with anal.; Mauritz, Ann. Mus. Nat. Hung., 550, 1908; from basalt of Montresta, Sardinia; Deprat, Bull. Min. Soc., **31**, 181, 1908; also, Millosevich, Rend. Acc. Linc., **17**, (1), 267, 1908; and (with anal.); Pelacani, *ibid.*, **17**, (2), 70, 1908.

Opt. — Effect of low temperatures upon optical properties; Panichi [Mem. Acc. Linc., **4**, 389, 1902], Zs. Kr., **40**, 86; from Biella, Italy, with optical and chemical study; Zambonini, Zs. Kr., **40**, 266, 1904; refractive indices; Gaubert, Bull. Soc. Min., **30**, 104, 1907.

Chem. — Anal. from Crownprince Rudolf Island; Colomba, [Osservazioni Sci. spedizione polare, Duca Abruzzi. Milano, 1903]; Zs. Kr., **41**, 279. Study of rôle played by water in the constitution; Zambonini, [Mem. Acc. Linc., **5**, 344; **6**, 102, 1905]; Zs. Kr., **43**, 395; also Ferro, Rend. Acc. Linc., **14**, (2), 140, 1905. Anal. of material from Iceland with discussion of chem. comp.; S. Hillebrand, Ber. Acad. Wien, **115**, 712, 1906. Anal. of material from Teigarhorn, Iceland, with discussion of composition; Baschieri, Att. Soc. Tosc., **24**, 1908. Discussion of chem. comp.; Zambonini, Mem. Acc. Sci. Napoli, **14**, 96, 1908.

Absorption of various liquids on cooling after having been heated; Gaubert, Bull. Soc. Min., **26**, 178, 1903.

**Hibschite.** *F. Cornu*, *Min. petr. Mitth.*, **24**, 327, 1905; **25**, 249, 1906.

Isometric. In minute crystals, octahedrons and less often dodecahedrons; very rarely isolated, usually grouped in parallel position enveloping dodecahedrons, or grains, of melanite. No cleavage. Very brittle.  $H = 6$ .  $G = 3.05$ . Colorless or pale yellow. Optically isotropic; occasionally shows optical anomalies, analogous to those of garnet. Refractive index 1.67.

Composition as for lawsonite,  $H_2CaAl_2Si_2O_{10}$ . This is deduced from analysis of material, (1) consisting of melanite (titanmelanite) and hibschite. The pure garnet gave the results under (2), leaving (3) as the composition of hibschite, reduced to 100.

	SiO <sub>2</sub>	TiO <sub>2</sub>	Fe <sub>2</sub> O <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub>	CaO	MgO	H <sub>2</sub> O
1. <i>Melanite</i> + <i>Hibschite</i>	37.70*	....	8.46	22.38	21.31	1.86	8.59 = 100.30
2. <i>Melanite</i> (pure)	32.15	6.08	20.99	6.65	32.45	0.68	0.95 = 99.95
3. <i>Hibschite</i>	37.12	....		32.82	13.72	2.64	13.70 = 100

\* TiO<sub>2</sub> determined on separate sample 1.76 p. c.

B. B. infusible; yields water freely. Easily attacked by acids and alkalis, somewhat less so after ignition.

From the phonolite of the Marienberg near Aussig, Bohemia, where it occurs enveloping green crystals of a titaniferous melanite in inclusions in a calcareous marl.

Also occurs in limestone inclusions from the basalt of Aubenas in the Vivarais, Ardèche, cf. Lacroix, *Les Enlaves des roches volcaniques*, Mâcon, 1893, p. 149, and Cornu, l. c. p. 265.

Named after Professor J. E. Hibsch.

**HIELMITE**, see under *Uraninite*.

**Hillebrandite.** *F. E. Wright*, *Am. J. Sc.*, **26**, 551, 1908.

Orthorhombic; radiating fibrous. Cleavage probably after (110). Brittle.  $H$ . about 5.5.  $G = 2.692$ . Color pure porcelain white, often with faint tinge of pale green.  $n$  about 1.61. Birefringence weak to medium, negative.  $2E$  medium with strong dispersion  $v > \rho$ .

Comp.  $Ca_2SiO_4 \cdot H_2O$ ; SiO<sub>2</sub>, 31.74; CaO, 58.81; H<sub>2</sub>O, 9.45.

Anal. by E. T. Allen:

SiO <sub>2</sub>	TiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	FeO	MnO	MgO	CaO	Na <sub>2</sub> O	K <sub>2</sub> O	H <sub>2</sub> O
32.59	0.02	0.23	0.15		0.01	0.04	57.76	0.03	0.05	9.36 = 100.24

In HCl separates some silica but otherwise dissolves. Difficultly fusible to colorless glassy bead, giving calcium flame.

Found in contact zone between limestone and diorite in Velardeña mining district, Mexico, associated with gehlenite and spurrite. Named in honor of Dr. W. F. Hillebrand.

**HISINGERITE**, *Min.*, p. 702. — From Ritenbeuk or Godhavn district, Greenland, with anal.; Nicolau, [*Medd. om Grönl.*, **24**, 215, 1901]; *Min. Grönl.*, 322.

**Histrixite.** *W. F. Petterd*, *Notes on Minerals Occurring in Tasmania*, *Proc. Roy. Soc. Tasmania*, 18, 1902; *Zs. Kr.*, **42**, 393. Occurs in radiating groups of prismatic (orthorhombic) crystals, striated longitudinally and showing indistinct acute terminations; also massive with foliated structure.  $H = 2$ , slightly sectile. Luster metallic. Color and streak steel-gray, when massive shows iridescent tarnish. Analyses on material regarded as pure.

	S	Bi	Sb	Cu	Fe
1.	24.05	55.93	10.08	6.86	5.18 = 102.10
2.	23.01	56.08	9.33	6.12	5.44 = 99.98

The formula deduced is  $7Bi_2S_3 \cdot 2Sb_2S_3 \cdot 5CuFeS_2$ .

Occurs associated with bismuthinite and pyrite in a massive body of tetrahedrite at the Curtin-Davis mine, Ringville, Tasmania. Named from the Latin *hystrix* (*histris*), a porcupine.

**HITCHCOCKITE**, see *Plumbogummite*.

**HOERNESITE**, *Min.*, p. 817. — Artif.; de Schulten, *Bull. Min. Soc.*, **26**, 81, 1903.

**Hollandite.** *L. L. Fermor*, [*Trans. Min. Geol. Inst. India*, **1**, 76, 1906]; *Rec. Geol. Sur. India*, **36**, 295, 1908. A crystallized manganate of manganese, barium and ferric iron,  $m(Ba, Mn)_2 MnO_5 + n Fe_4(MnO_5)_2$ . Author discusses its relations to *coronadite*, which see. Found in the Kājildongri manganese mine, Jhābua State, Central India. Named in honor of T. H. Holland, Director of the Geol. Sur. of India.



HOPEITE, Min., p. 808; App., p. 35. — Crystals from Moresnet, Belgium, with new form (130); also opt. study; Buttgenbach, Ann. Soc. Geol. Belg., 33, M9, 1906; crystals found associated with bone breccia in a cave in the surface lead and zinc ores of Broken Hill mines, northwestern Rhodesia, studied by Spencer, Min. Mag., 15, 1, 1908, gave following new facts concerning the mineral. From measured angles (100): (120) = 49° 10' and (100): (101) = 50° 34' was calculated ratio,  $\bar{a} : \bar{b} : \bar{c} = 0.5786 : 1 : 0.4758$ . Three cleavages  $a(100)$  perfect with pearly luster on cleavage face;  $b(010)$ , good;  $c(001)$  poor but showing in cracks on crystals.  $H. = 3.25$ .  $G. = 3.0-3.1$ . Cleavage plate parallel to  $b(010)$  shows interbanding of two modifications,  $\alpha$ -hopeite and  $\beta$ -hopeite.  $\alpha$ -hopeite has higher birefringence. Acute negative bisectrix  $\perp b(010)$ . Ax. pl.  $\parallel c(001)$ .  $2E = 58\frac{1}{2}^\circ$ , approx.  $\beta$ -hopeite lower birefringence. Bisectrix as in  $\alpha$ -hopeite. Ax. pl. sometimes  $\parallel c(001)$ , sometimes  $\perp c(001)$ . In first case  $2E = 32\frac{1}{2}^\circ$  (approx.) and in latter  $2E = 20^\circ$  (approx.). When warmed  $\alpha$ -hopeite is destroyed at 105° C. while  $\beta$ -hopeite becomes opaque only at 139° C.  $\beta$ -hopeite has slightly lower Sp. G. than  $\alpha$ -hopeite. Analyses prove two modifications to be the same and agree with formula,  $Zn_3P_2O_3 \cdot 4H_2O$ ;  $ZnO$ , 53.3;  $P_2O_5$ , 31.0;  $H_2O$ , 15.7.

	ZnO	P <sub>2</sub> O <sub>5</sub>	H <sub>2</sub> O
$\alpha$ -hopeite	52.1	31.8	16.1 = 100.00
$\beta$ -hopeite	51.9	[31.9]	16.2 = 100.00

Artif.; de Schulten, Bull. Min. Soc., 27, 100, 1904.

HORTONOLITE, Min., p. 455. — Occurs as vein mineral associated with actinolite and clinocllore at Iron Mine Hill, Cumberland, R. I. Analysis; Johnson and Warren, Am. J. Sc., 25, 35, 1908; Warren, Zs. Kr., 44, 209.

Howdenite. — Variety of chiasolite from Bimbowrie, S. Aus; Am. J. Sc., 24, 183, 1907.

HOWLITE, Min., p. 881. — Occurs in large quantities at the borax mines in the Mohave desert, 16 miles N. E. of Daggett, San Bernardino Co., California. Varies in form from friable aggregates of fine scaly crystals (anal. 1) to hard rocklike amorphous masses (anal. 2). W. B. Giles, Min. Mag., 13, 354, 1903.

	SiO <sub>2</sub>	B <sub>2</sub> O <sub>3</sub>	CaO	H <sub>2</sub> O	MgO, Na <sub>2</sub> O
1.	15.50	44.38	28.45	11.58	0.09 = 100
2.	15.33	43.78	28.44	11.39	1.06 = 100

HUANTAJAYITE, Min., p. 156. — Synthesis of; Cornu, Jb. Min., 1, 22, 1908.

HÜBNERITE, Min., p. 982. — Anal. from Dragoon, Summit, Ariz.; Hobbs, Amer. Geol., 36, 179; Zs. Kr., 43, 394.

HUDSONITE, cf. *Amphibole*.

Hulsite. A. Knoff and W. T. Schaller; Am. J. Sc., 25, 323, 1908.

Orthorhombic (?) as small crystals or tabular masses. Prismatic cleavage;  $m \wedge m''' = 57^\circ 38'$ . Twinning frequent with  $\bar{c}$  axis as twinning axis; one individual being revolved 120° from the other. Color and streak black. Luster submetallic.  $H. = 3$ .  $G. = 4.28$ .

Comp. Originally given as a hydrous borate of ferrous and ferric iron and magnesium. Subsequently about 11% of  $SnO_2$  was discovered in the mineral and the revised formula (priv. contr. W. T. Schaller) is  $10(Fe, Mg)O \cdot 2FeO_3 \cdot 1SnO_2 \cdot 3B_2O_3 \cdot 2H_2O$ .

Pyr. Readily sol. in HCl and HF. Yields water in C. T. Fuses quietly to a dull black slag and tinges the flame green. Boron reaction with  $HKSO_4$  and  $CaF_2$ .

Occ. Found in metamorphosed limestone at a granite contact at Brooks mountain, Seward Peninsula, Alaska, associated with vesuvianite, magnetite and calcite. Named in honor of Mr. Alfred Hulse Brooks of the U. S. Geol. Sur.

HUREAULITE, Min., p. 832. — Artif.; de Schulten, Bull. Min. Soc., 27, 123, 1904.

Hussakite, see under *Xenotime*.

Hutchinsonite. R. H. Solly, Proc. Cambridge Phil. Soc., 12, 277, 1904; Min. Mag., 14, 72, 1905. G. T. Prior, Nature, 71, 534, 1905. G. F. H. Smith and G. T. Prior, Min. Mag., 14, 284, 1907.

Orthorhombic. Axes  $\bar{a} : \bar{b} : \bar{c} = 1.6343 : 1 : 0.7549$  ( $\bar{a}$  as given by Solly = 0.8175). Angles (100): (340) = \*47° 28'; (100): (201) = \*47° 16'.

Commonly in flattened rhombic prisms with numerous small faces of domes and pyramids;  $\bar{y}$  (140) prominent. Principal forms:  $a(100)$ ,  $b(010)$ ,  $F(210)$ ,  $l(740)$ ,  $k(320)$ ,  $i(540)$ ,  $m(110)$ ,  $\bar{h}(340)$ ,  $f(120)$ ,  $g(140)$ ,  $U(102)$ ,  $d(101)$ ,  $W(302)$ ,  $u(201)$ ,  $v(301)$ ,  $w(401)$ ,  $p(111)$ ,  $N(221)$ ,  $n(121)$ ,  $t(342)$ ,  $q(322)$ ,  $o(211)$ ,  $Q(311)$ .

Cleavage *a* good. Fracture conchoidal. Brittle. *H.* = 1.5 - 2. *G.* = 4.6. Luster adamantine. Color and streak, scarlet-vermilion to deep cherry-red. Transparent to translucent. Ax. pl. || *a* (100).  $Bx_{ac} \perp$  to *b* (010). Negative. Birefringence fairly strong. Pleochroism weak. Composition,  $(Tl, Ag, Cu)_2S.As_3S_3 + PbS.As_3S_3$  (?).

Analyses on small amounts of somewhat doubtful purity. I on crystals; II on variety occurring in needles.

	Ag	Tl	Pb	Cu	Fe	As	Sb	S
I.	9.0	25.0	12.5	...	...	30.5	...	26.0 = 103.0
II.	2.0	18.0	16.0	3.0	0.5	29.5	2.0	26.5 = 97.5

Occurs in the white dolomite of the Lengenbach quarry in the Binnenthal, Switzerland; closely associated with sartorite and rathite. This name is also used by Koechlin for an undescribed mineral from the Binnenthal, Min. Mitth., **23**, 551, 1904.

Named after Dr. Arthur Hutchinson, of Cambridge, England.

**Hyalalophane.** *G. D'Achiardi*, [Atti. Soc. Toscana Sci. Nat., **12**, 32, 1898]. Allophane containing an excess of silica, supposed to be due to the presence of admixed hyalite, from Sardinia. Min. Mag., **12**, 384; Zs. Kr., **32**, 521.

**HYALOPHANE**, Min., p. 321. — Crystallographic and optical study of crystals from the Binnenthal, Switzerland; Baumhauer, Zs. Kr., **37**, 603, 1903. Crystals from same locality showing new forms (380), (212), (211); Solly, Min. Mag., **14**, 17, 1904. Crystallographic and optical study with anal. and discussion of isomorphism of barium and potassium feldspars; Strandmark, G. För. Förh., **25**, 289, 1903; **26**, 97, 1904.

**HYALOSIDERITE**, see *Chrysolite*.

**HYALOTEKITE**, Min., p. 422. — Discussion of chem. comp.; Cesáro, Mem. Soc. Liège, **5**, No. 6, 26, 1904.

**HYDROCERUSSITE**, Min., p. 299. — Crystals from Långban are hexagonal with *c* (0001), *o* (10 $\bar{1}$ 2), *p* (10 $\bar{1}$ 1); *cp* = \*58° 36' and *c* = 1.4188. Flink, Bull. G. Inst. Upsala, **5**, 94, 1901.

**Hydrogöthite.** *P. Zemjatschensky* [Trav. Soc. Nat. St. Petersburg, **20**, 206, 1889], Zs. Kr., **20**, 185; [Trav. Soc. Nat. St. Petersburg, **34**, 1903], Zs. Kr., **41**, 187; *J. Samojloff*, Zs. Kr., **35**, 272, 1901.

Orthorhombic, radiating fibrous. Two cleavages at right angles. *H.* = 4. *G.* = 3.7. Color and streak brick red. Optically —. Ax. pl.  $\perp$  to best cleavage. Pleochroism strong, orange red to yellow green. Comp.  $3Fe_2O_3 \cdot 4H_2O$ ;  $Fe_2O_3$ , 86.9;  $H_2O$ , 13.09.

Anal., Samojloff, loc. cit.,  $Fe_2O_3$ , 86.01;  $H_2O$ , 12.95. Occ. associated with limonite near Lipetz and Dankow, etc., Gouvernement Tula, Russia.

**HYDROMAGNESITE**, see *Giorgiosite*.

**HYDROUS CALCIUM CARBONATE.** — Occurs as a white fungus-like coating on marl on shore of river Weichsel near Nowo-Alexandria, Poland, in felted mass of thin colorless needles or plates. *G.* = 2.63. Shows inclined extinction and is monoclinic or triclinic. Analysis gives  $CaCO_3$  with probably  $3H_2O = CaCO_3 \cdot 3H_2O$ . Iwanoff, [Ann. géol. et min. Russie, **8**, 23, 1905]; Zs. Kr., **44**, 87.

**HYDROUS IRON PHOSPHATE.** — Anal. of material from Kutschuk-Eltigen and Nowy Karantin, on Kertsch and Taman peninsulas, Russia, gave  $Fe_2O_3$ , 47.71;  $P_2O_5$ , 38.87;  $H_2O$ , 13.42. Orthorhombic. Cleavage in three directions nearly at right angles to each other. Weak birefringence. Does not correspond to any known mineral. Tschirwinskij, [Ann. géol. et min. Russie, **7**, 28, 1904]; Zs. Kr., **43**, 77.

**HYPERSTHENE**, Min., p. 348. — Crystals from a volcanic bomb, St. Christopher; Fels, Zs. Kr., **37**, 455, 1903; from Karra Akungnak, Greenland; Böggild, Min. Grönl., 363.

Optical constants of rock forming hypersthene; Dupare and Pearce, Bull. Soc. Min., **31**, 106, 1908.

**ICE**, Min., p. 205; App., p. 36. — Concerning crystalline structure and its influence on glacial movement; Mügge, Jb. Min., **2**, 123, 1899; **2**, 80, 1900, and v. Drygalski, *ibid.*, **1**, 71, 1900; **1**, 37, 1901; Zs. Kr., **37**, 635.

Crystals formed in air; Futterer, [Ver. naturwiss. Vereins Karlsruhe, **14**, 1, 1901], [Ber. ü. d. 34. Versamml. d. oberrhein. geol. Ver. in Diedenhofen, April, 1901]; Zs. Kr., **38**, 509.

**IDDINGSITE**, App., p. 36. — Occurrence as pseudomorph after olivine in basalt in the Mittelgebirge, Bohemia; Hibsich, Min. Mitth., **19**, 98.

ILMENITE, Min., p. 217; App., p. 36. — Crystals from the Eichamwand, Prägraten, Tyrol, described (*y* (3142) new); Sustschinsky, Zs. Kr., **37**, 60, 1902; from near Ofenhorn, Binnenthal, Switzerland, with following new forms:  $\alpha$  (0.7.7.20), X (4483),  $\gamma$  (1232),  $\delta$  (2467),  $\beta$  (5.5.10.24), *h* (4150), *q* (6241); *k* (3121); *r* (4041) and *d* (1012); Solly, Min. Mag., **14**, 184, 1905.

Study of the relations existing between chemical composition, specific gravity and length of *c* axis of ilmenites from various localities shows that with increase in percentage of TiO<sub>2</sub> there is a corresponding increase in the value for *c* and a decrease in the specific gravity; Doby and Melzer, Zs. Kr., **39**, 526.

Anal. from Sundsvale, Sweden; Tschernik, [Jour. phys. Chim. Russe, **36**, 457, 712, 1904]; Zs. Kr., **43**, 78.

Microscopic intergrowth with magnetite from Brazil; Hussak, Jb. Min., **1**, 94, 1904.

Segregation from basic eruptive rocks; Vogt, Zs. pr. Geol., **8**, 233, 370, 1900; 9, 9, 180, 289, 327, 1901.

Occurrence in south Norway with anal. by Wallin; Brögger, Min. Süd.-Nor. Granitpeg., **39**, 1908.

Picrotitanite (Min., p. 218), or *picroilmenite*, (Groth, Tabell. Übers. d. Min., 4th Ed., 143, 1898). Occurrence in Balangoda district, Ceylon, with analyses; Crook and Jones, Min. Mag., **14**, 165, 1906.

Small crystals found in albite veins in upper Doria Riparia valley considered to be *mohsile* which on account of crystallographic differences is thought by author to be an independent species. Colomba, Att. Acc. Torino, **37**, 343, 1902.

ILMENORUTILE, Min., p. 238. — New determinations and new analyses (see below I and II) by Prior, Min. Mag., **15**, 85, 1908, indicate that the percentages of TiO<sub>2</sub> as recorded were too high and those of Nb<sub>2</sub>O<sub>5</sub> too low. Simplest formula to be derived from new analyses is FeO.Nb<sub>2</sub>O<sub>5</sub>.5TiO<sub>2</sub>. Suggested that ilmenorutile is one end of a mineral series while *strüverite* is the other.

	TiO <sub>2</sub>	SiO <sub>2</sub>	Nb <sub>2</sub> O <sub>5</sub>	Ta <sub>2</sub> O <sub>5</sub>	FeO	MgO	CaO	
I. Ilmen Mts.	53.04	....	21.73	14.70	10.56	....	<i>tr.</i>	= 100.03
II. Iveland, Norway	54.57	....	32.15	...	12.29	....	0.11	= 99.12
III. Evje, Norway	73.78	0.23	13.74	0.43	11.58	0.04	0.22	= 100.02
IV. Tvedstrand, Norway	67.68	0.05	20.31	....	11.68	<i>tr.</i>	0.28	= 100.00

Anal. III and IV by Heidenreich, quoted by Brögger, Min. Süd.-Nor. Granitpeg., **41**, 1908.

ILVAITE, Min., pp. 541, 1037; App., p. 37. — Crystals from Siorarsiu, Tunugdliarfik-Fjord, South Greenland; Moesz, [Math. és term. tud. Értesítő, **17**, 442, 1899], Zs. Kr., **34**, 708; from same locality showing following new forms:  $\gamma$  (160),  $\sigma$  (081), *f* (041), *i* (401), *m* (621),  $\zeta$  (331),  $\epsilon$  (431); analysis showing 2.2% MnO; axial ratio  $\alpha : \bar{b} : c = 0.6766 : 1 : 0.4499$ ; etching figures and optical characters described with anal. by Christensen; Böggild, Medd. om Grönland, **25**, 45, 1902; crystals (with anal.) from Potter Creek, Shasta Co., Calif.; Prescott, Am. J. Sc., **26**, 14, 1908.

Anal. of material from Elba and discussion of chem. comp.; Himmelbauer, Ber. Acad. Wien, **115**, 1177, 1906; chem. comp. also; Baschieri, Proc. Soc. Tosc., May, 1907; Mar., 1908.

**Impsonite.** An asphalt closely similar to albertite but differing in being almost insoluble in turpentine. Found occurring in veins in shales from Impson valley, Indian Territory. Taff, Am. J. Sc., **8**, 219, 1899; see under *Asphalt*.

INESITE, Min., p. 564; App., p. 37. — From near Villa Corona, Durango, Mexico, in tufts of radiating crystals of a flesh color. New forms observed, *k* (11.0.12) and *s* (946). Following analysis:

	SiO <sub>2</sub>	MnO	FeO	CaO	MgO	H <sub>2</sub> O (cryst.)	H <sub>2</sub> O (const.)	
G = 2.965	44.89	36.53	2.48	8.24	<i>tr.</i>	5.99	2.21	= 100.34

giving H<sub>2</sub>(Mn,Ca),Si<sub>2</sub>O<sub>9</sub>.3H<sub>2</sub>O for formula. Farrington, Field Mus., **1**, 7, 221, 1900; Zs. Kr., **36**, 76. Also in fibrous masses and in crystals in granular hematite at Långban, Sweden; Flink, Bull. G. Inst. Upsala, **5**, 92, 1901.

Discussion of chem. comp.; Zambonini, Mem. Acc. Sci. Napoli, **14**, 125, 1908.

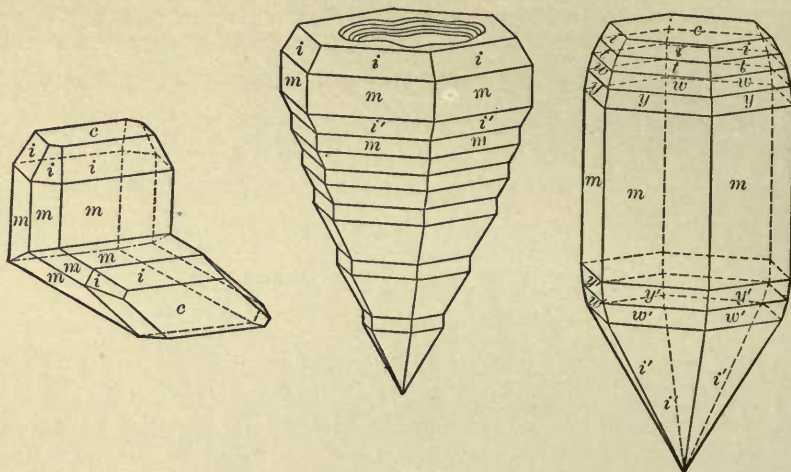
**Iodembolite.** G. T. Prior and L. J. Spencer, Min. Mag., **13**, 177, 1902. — A name substituted by Prior and Spencer for iodobromite, on the ground that the composition is not definite, as claimed by Lasaulx, and that the name is misleading as to the composition. See *Cerargyrite*.

A mineral belonging here giving reactions for AgCl, AgBr and AgI occurs in thin seams and crusts of a yellow color in a vein of quartz and calcite near Globe, Pinal county, Arizona; W. P. Blake, Am. J. Sc., **19**, 230, 1905.

IODOBROMITE, Min., p. 160; see *Iodembolite* above.

IODYRITE, Min., p. 160. — Crystals from Broken Hill, N. S. W., simple with *c* and *m*; twinned, twinning pl. *e* (3034) giving pseudo-tetrahedral forms. Discussion of behavior when heated and relation to other similar iodides; Spencer, Min. Mag., **13**, 45. See also Prior and Spencer, *ibid.*,

185. Crystal from Broken Hill, N. S. W. showing  $a$  (11 $\bar{2}0$ ); crystals from Tonapah, Nev. (figs.), showing following new forms,  $r$  (7044),  $t$  (7073),  $x$  (7071),  $y$  (9091),  $y'$  (9091),  $u$  (9092),  $w'$  (9092)  $s'$  (15.0.15.8),  $z$  (3.0.33.2). With  $c$  (0001):  $i$  (20 $\bar{2}1$ ) =  $62^\circ 10' 30''$ ,  $c = 0.8204$ . Crystals varied



Iodyrite, Tonapah.

in habit but usually distinctly hemimorphic. Twins with tw. pl.  $e$  (30 $\bar{3}4$ ). Etching figures. Sp. G. = 5.5115. Anal.; Kraus and Cook, *Am. J. Sc.*, **27**, 210, 1909.

**IOLITE**, *Min.*, p. 419; *App.*, p. 37. — Crystals from Oetzthal and Kaunserthal, Switzerland; Gemböck, *Zs. Kr.*, **31**, 248; from Uioirdlersuak, Greenland; Böggild, *Min. Grönl.*, 344. Discussion of pseudomorphs of iolite; Gareiss, *Min. Mitth.*, **20**, 1, 1901.

Comp. discussed by Weibull (anal. by Ramberg) from Långfalls mine, Grangårde parish, Sweden; G. För. Förh., **22**, 33, 1900. Rôle of water in; Zambonini, *Mem. Acc. Sci. Napoli*, **14**, 42, 1908.

Occurrence in North Celebes with analysis; Bücking, *Ber. Senckenberg. naturforsch. Ges.*, Frankfurt, **3**, 1900; *Zs. Kr.*, **36**, 654; in tourmaline veins of Elba; D'Achiardi, *Proc. Soc. Tosc.*, Jan., 1900; occurrence of iolite and its alteration products with description of crystals from, Puy-de-Dôme, Loire and Rhône; Gonnard, *Bull. Min. Soc.*, **31**, 171, 1908.

Origin and association with bibliography; Teall, *Proc. Geol. Ass.*, **16**, 61, 1899.

**IRON**, *Min.*, pp. 28, 1037; *App.*, p. 37. — Crystallization; Osmond and Cartand, [*Ann. d. Mines*, **17**, 110, 1900; **18**, 113, 1900]; *Zs. Kr.*, **35**, 657, 658. Crystal from meteorite from Laborel measuring 7 × 5 mm. showed cube, octahedron, dodecahedron with small vicinal faces of tetrahedron and trisectahedron; Berwerth, *Min. Mitth.*, **25**, 511, 1906. Artif. crystals; Cornu, *Centralbl. Min.*, 545, 1908.

Structure planes; Mügge, *Jb. Min.*, **2**, 63, 1899. Mechanical properties of crystallized iron; Osmond and Frémont, *C. R.*, **141**, 361, 1905. Physical-chemical observations on meteoric and furnace iron; Rinne, *Jb. Min.*, **1**, 122, 1905.

Composition of iron from Ovfak, Greenland; Winkler, [*Vet.-Akad. Förh.*, 495, 1901]; *Zs. Kr.*, **37**, 286.

Occurrence of native iron enclosed in a rounded basaltic fragment found in a tuff deposit near Ofseiden, on the river Ohm, Germany; Schwantke, *Centralbl. Min.*, 65, 1901.

Studies of meteorites from the following localities: Salt River, Kentucky; Toluca, Mexico; Capland, South Africa; Babbs Mill, Tenn.; Illinois Gulch, Deer Lodge Co., Mon.; Deep Springs Farm, Rockingham Co., N. C.; Hammond, Wis.; Cacaria and Nezquital, Durango, Mexico; Bückeberg, Germany; Murphy, Cherokee Co., N. C.; St. Francois Co., Mo.; Cosby's Creek, Cocke Co., Tenn.; Cañon Diablo, Ariz.; Magura, Hungary; Quesa, Spain; Merceditas, Chile; Thunda, Queensland, Australia; San Antonio, Texas; Cohen, [*Ann. nat. hist. Hofmus.*, **15**, 74, 351, 1900]. [*Mitt. d. nat.-wiss. Ver. Neuvorpomm. u. Rügen*, **33**, 1900], *Ber. Ak. Berlin*, 1122, 1900; all summarized in *Zs. Kr.*, **36**, 644. Meteoric irons from Great Namaqualand, from South Africa and Patagonia; Fletcher, *Min. Mag.*, **14**, 28, 37, 41, 1904; Japanese occurrences; Jimbo, *Beitrag Min. Japan*, **2**, 30, 1906.

See *Awaruite*.

**Irvingite.** *S. Weidman*, *Am. J. Sc.*, **23**, 451, 1907. — A mica in crystals up to over an inch in diameter. Basal cleavage. Prismatic parting. Color from grayish to yellowish and pinkish white. Folia tough and elastic. Easily fusible. Axial angle somewhat larger than lepidolite and zinnwaldite.

Comp. A lithia mica corresponding to  $6\text{SiO}_2 \cdot 1\text{Al}_2\text{O}_3 \cdot 2\text{R}_2\text{O} \cdot 1(\text{F.OH})$ .

Anal. by Lenher:

$\text{SiO}_2$	$\text{TiO}_2$	$\text{Al}_2\text{O}_3$	$\text{Fe}_2\text{O}_3$	FeO	MgO	CaO	$\text{K}_2\text{O}$	$\text{Na}_2\text{O}$	$\text{Li}_2\text{O}$	F	$\text{H}_2\text{O}$
57.22	0.14	18.38	0.32	0.53	0.09	0.20	9.12	5.14	4.46	4.58	1.66

[less 1.93, O = F] = 99.91

Found in pegmatite veins near Wausau, Wisconsin. Named after Prof. R. D. Irving, the geologist.

**Isorthose**, var. of *orthoclase*, which see.

**IWAARITE**, *Min.*, p. 448. — Analysis of material from Iiwaara, Finland, gave  $\text{SiO}_2$ , 27.35;  $\text{TiO}_2$ , 16.44;  $\text{Al}_2\text{O}_3$ , 1.50;  $\text{Fe}_2\text{O}_3$ , 20.09; FeO, 2.90; MnO, trace; MgO, 0.82; CaO, 30.99; total = 100.09. Dittrich, [*Bull. de la Commission Géol. de Finlande, Helsingfors*, 11, 1900]; *Zs. Kr.*, **36**, 196.

**JACOBSITE**, *Min.*, p. 227. — Analysis of material from Bulgaria, Kováf, [*Abh. böhm. Akad., Prag*, 27, 1900]; *Zs. Kr.*, **36**, 202.

**JADEITE**, *Min.*, p. 369; *App.*, p. 37. — From Bhamo, Burma, with optical properties and analysis; Krenner; [*Wissenschaftliche Ergebnisse der Reise des Grafen Béla Széchenyi in Ostasien, Budapest*, 3, 285, 1897]; *Zs. Kr.*, **31**, 502. Occurrence and optical characteristics in rocks on the Cyclades islands; Ktenas, *Min. Mitth.*, **26**, 277.

Analysis of jadeite from Piedmont; Mrazec, [*Bull. soc. d. sc. de Bucarest-Roumanie*, 7, 187, 1898]; *Zs. Kr.*, **32**, 623. Occurrence and analysis from Susa; Piolti, *Atti della R. Accad. d. Sc. di Torino*, **34**, 600, 1899. Analyses of ancient axes made of jadeite from Hungary; Berwerth, *Min. Mitth.*, **20**, 357.

Occurrence in the western Alps and in Liguria; Franchi, *Rend. Acc. Lincei*, **9**, (1), 349, 1900. From Cassine, Italy, with anal.; Colomba, *Riv. Min.*, **27**, 1901. Jadeite and chloromelanite in prehistoric objects from Guatemala; Bauer, *Centralbl. Min.*, 65, 1904. Study of jadeite from Upper Burma; Bauer, *Centralbl. Min.*, 97, 1906; Bleeck, *Rec. Geol. Sur. India*, **36**, 254, 1908.

Historical; Berwerth, *Min. Mitth.*, **24**, 228, 1905.

An elaborate study of chemical composition (with 58 new analyses), structure, microscopical and optical properties, with discussion of origin, included and associated minerals, etc., to be found in book entitled "Investigations and Studies in Jade: The Bishop Collection," by H. R. Bishop, 2 vols., privately printed in New York, 1906. Contributors to the chapter on mineralogy of the mineral include Penfield, Foote, Iddings, Clarke, Palache, Pirsson, Washington and Walden.

**JAMESONITE**, *Min.*, p. 122; *App.*, p. 37. — Analyses of material from various localities; Guillemin, [*Inaug.-Diss. Breslau*, 1898], *Zs. Kr.*, **33**, 74; of material from Campiglia Soana, in Ivrea; Novarese, *Boll. Com. Geol. Ital.*, **23**, 319, 1902.

Composition discussed by Spencer, *Min. Mag.*, **14**, 207 and 310. A new analysis of crystallized jamesonite from Bolivia does not conform to the formula  $2\text{PbS} \cdot \text{Sb}_2\text{S}_3$  (see below), and from study of other analyses author concludes that this formula is wrong. All "flexible feather ore" must be removed from this species, as the fibers of jamesonite on account of its basal cleavage are brittle. Cleavages  $\parallel$  to *m* and *a* were not observed on the Bolivian material. "Flexible feather ore" may be any one of several related species. *Warrenite* (domingite) should probably be included in jamesonite; the formula given,  $3\text{PbS} \cdot \text{Sb}_2\text{S}_3$ , is the same as the original formula by Rose for jamesonite. The formula deduced from the following analyses by Prior is  $7(\text{Pb}, \text{Fe}) \text{S} \cdot 4\text{Sb}_2\text{S}_3$ .

	S	Sb	Pb	Fe	Cu	Ag
I. Crystallized, Bolivia	20.52	34.53	41.18	2.76	0.26	0.01 = 99.26
II. Massive, Bolivia	21.37	34.70	40.08	2.79	0.22	0.13 = 99.29

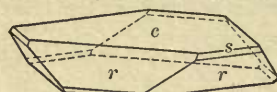
**Janosite**, see *Copiapite*.

**JAROSITE**, *Min.*, p. 974; *App.*, p. 37. — Occurrence in Schlaggenwald, Bohemia, in small crystals showing combination of base, low positive and steeper negative rhombohedrons. Some of the crystals in basal cleavage plates showed abnormal double refraction and division into six portions, the two opposite ones being of the same optical orientation and giving a negative biaxial interference figure. The strength of the double refraction and the axial angle varied in different specimens. Slavik, *Zs. Kr.*, **39**, 296. Measurement of crystals from Dakota with new axial ratio; Cesáro, *Bull. Ac. Belg.*, 137, 1905.

Analysis of material from Sichertin near Kunstadt in Mähren; Kováf [*Progr. d. čechosl. Handels-Akademie Prag*, 1903], *Zs. Kr.*, **39**, 400.

Occurrence from Chocaya, Potosi, Bolivia; Spencer, *Min. Mag.*, **14**, 342.

*Natrojarosite* (Hillebrand and Penfield, *Am. J. Sc.*, **14**, 211, 1902; Turner, *ib.*, **13**, 345) is a variety containing sodium instead of potassium (formula, see below) from the Soda Springs valley, Esmeralda Co., Nevada, on the road from Sodaville to the Vulcan copper mine. As a glistening powder made up of minute tabular crystals, with  $c$  (0001),  $r$  (10 $\bar{1}$ 1) and  $s$  (02 $\bar{2}$ 1),  $cr = 51^\circ 53'$   $\therefore c = 1.104$ .  $G. = 3.18$ . Color in the mass yellowish brown, of single crystals

A 3D perspective drawing of a tabular crystal. The vertical axis is labeled 'c'. Two horizontal axes are labeled 'r'. A diagonal axis is labeled 's'. The crystal is shown as a flat, rectangular plate with dashed lines indicating hidden edges.

Natrojarosite.

golden yellow. Analysis, after deducting impurities:

SO <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	Na <sub>2</sub> O	K <sub>2</sub> O	H <sub>2</sub> O
32.94	49.39	6.18	0.37	11.12 = 100

A specimen from Cook's Peak, New Mexico, which yielded 4.49 Na<sub>2</sub>O, 0.96PbO (*ibid.*, p. 213) also belongs here. Another form, described by Headden (*ibid.*, **46**, 24, 1893) from the Buxton mine, Lawrence Co., South Dakota, gave after deducting impurities (recalc. by H. and P., l. c.) 4.86 Na<sub>2</sub>O, 1.65 K<sub>2</sub>O.

*Plumbojarosite* is a variety containing lead in place of potassium (formula, see below) described by the same authors (*ibid.*, p. 213) from Cook's Peak, New Mexico. Like natrojarosite occurs as a crystalline powder made up of minute tabular crystals with  $ss = 109^\circ 20'$  and  $c = 1.216$ .  $G. = 3.665$ . Color of the mass dark brown, of single crystals golden yellow. Analysis, after deducting impurities:

SO <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	PbO	H <sub>2</sub> O
23.29	42.44	19.72	9.55 = 100

The relations of the minerals of the alunite-jarosite group in composition, axial ratio and optical character, as developed by Hillebrand and Penfield, is shown in the following table:

	Formula	$c$	$rr'$	Birefringence
Alunite	K <sub>2</sub> Al <sub>6</sub> (OH) <sub>12</sub> (SO <sub>4</sub> ) <sub>4</sub>	1.252	90° 50'	+
Jarosite	K <sub>2</sub> Fe <sub>6</sub> (OH) <sub>12</sub> (SO <sub>4</sub> ) <sub>4</sub>	1.245	90° 45'	—
Natrojarosite	Na <sub>2</sub> Fe <sub>6</sub> (OH) <sub>12</sub> (SO <sub>4</sub> ) <sub>4</sub>	1.104	85° 54'	—
Plumbojarosite	PbFe <sub>6</sub> (OH) <sub>12</sub> (SO <sub>4</sub> ) <sub>4</sub>	1.216	89° 42'	—

**Jentschite**, *Min. Mitth.*, **23**, 551, 1904. — A new mineral not yet described from the Binnenthal. In thin iron black tables, deeply grooved, with bright tarnish; up to 1 cm. in size. Probably identical with lengenbachite; Solly, *Min. Mag.*, **14**, 80, 1905 (footnote).

**JORDANITE**, *Min. pp.* 141, 1039; *App.*, p. 38. — Crystal forms and analysis of material from Binnenthal; Guillemin, [*Inaug.-Diss.*, Breslau, 1898], *Zs. Kr.*, **33**, 76.

Solly and Jackson, *Min. Mag.*, **12**, 282; *Zs. Kr.*, **35**, 321, have studied jordanite from the Binnenthal crystallographically and chemically. A list of 115 known forms (monoclinic, see *Min.*, p. 1039), 11 of which are new, is given. Four laws of twinning are given: (1) (101), indicated by numerous twin lamellæ; (2) (301), having law (1) always combined with it; (3) (101) (?); (4), (301) (Baumhauer gives this form by misprint as (103)). Analyses by Jackson:

	Pb	S	As
I.	68.61	18.19	12.32 = 99.12
II.	68.83	18.42	12.46 = 99.71

Study of the zonal relations of crystal faces on jordanite; Baumhauer, *Ber. Akad. Berlin*, **577**, 1900; *Zs. Kr.*, **38**, 635.

Occurrence with analysis in the Blei-Scharley mine near Beuthen, Upper Silesia; Sachs, *Centralbl. Min.*, 723, 1904.

**Justite = koenenite**. *Min. Mitth.*, **23**, 97, 1904.

**KAINITE**, *Min.*, p. 918; *App.*, p. 38. — Formation discussed; van't Hoff with von Euler-Chelpin, Meyerhoffer, *Ber. Ak. Berlin*, 1018, 1900; 424, 1901; 678, 1903; specimens from Wolfenbüttel, Brunswick, Germany, show a blue color and have the following pleochroism:  $a =$  violet;  $b =$  blue;  $c =$  yellow; Baumgärtel, *Centralbl. Min.*, 449, 1905. From Stassfurt, Busz; *Ber. Naturhist. Ver.*, Bonn, **1**, C, 2, 1906; *Ber. Med.-naturwiss. Ges.*, Münster, June, 1906.

**Kalgoorlite**. *E. F. Pittman*, *Rec. G. Surv. New South Wales*, **5**, 203, 1898. *A. Carnot*, *Bull. Soc. Min.*, **24**, 361, 1901. *T. A. Rickard*, *Trans. Am. Inst. Mng. Eng.*, **30**, 708, 1901. *L. J. Spencer*, *Min. Mag.*, **13**, 282, 1903.

Described by Pittman from Kalgoorlie, West Australia, as a new telluride having the composition HgAu<sub>2</sub>Ag<sub>6</sub>Te<sub>6</sub>; massive with sub-conchoidal fracture. Color iron-black;  $G. = 8.79$ . An analysis by J. C. H. Mingay (quoted by Spencer) gave: Te, [37.26]; Au, 20.72; Ag, 30.98; Hg, 10.86; Cu, 0.05; S, 0.13 = 100.

Carnot used this name for a mineral from the same source containing but 2.00 or 2.26 p.c. Hg, and essentially, if pure, a mercurial petzite. Rickard, however, urged that the mineral was to be regarded as an impure coloradoite, and Spencer shows that it is undoubtedly a mixture of coloradoite and petzite.

KALIBORITE, Min., p. 885. — Formation discussed; van't Hoff, Ber. Ak. Berlin, 1008, 1902.

KALIUMBLÖDITE, see *Leonite*.

KAOLINITE, Min., pp. 685, 1039. — Study of crystal plates from National Belle mine, Silverton, Colo., confirms the monoclinic character of the mineral; Milch, Centralbl. Min., 1, 1908.

Notes on optical properties; Dick, Min. Mag., 15, 124, 1908.

Observed in minute hexagonal scales (anal.) at the antimony mine of Miramont on the border of Cantal and Haute-Loire, France; Friedel, Bull. Soc. Min., 24, 6, 1901. Analyses of material from Gross-Tresny, Mähren; Kovář, [Abh. böhm. Akad., No. 15, 1, 1896]; Zs. Kr., 31, 524; from Vicz near Bistriz, Mähren; Kovář, [Chem. Blätter, 1899]; Zs. Kr., 34, 706. Chem. constitution; McNeil, Jour. Amer. Chem. Soc., 28, 592, 1906.

KATAPLEITE, see *Catapleite*.

KENTROLITE, Min., pp., 544, 1039. — Occurrence in copper mine of Bena Padru near Ozieri, Sardinia; Lovisato, Rend. Acc. Linc., 14, 696, 1905.

Kertschenite. S. Popoff, Centralbl. Min., p. 113, 1906.

In fibrous-radiated crystalline aggregates. H. = 3.5. G. = 2.65. Color dark green, nearly black. Streak green.

Comp. — A hydrated basic ferric phosphate.

Analysis:

	P <sub>2</sub> O <sub>5</sub>	Fe <sub>2</sub> O <sub>3</sub>	FeO	MnO	MgO	CaO	H <sub>2</sub> O
$\frac{1}{2}$	28.20	32.93	9.49	1.92	1.55	0.47	24.98 = 99.54

Occurs in the limonite deposits on the peninsula of Kertsch, Gov't Taurien.

Keweenawite. G. A. Koenig, Am. J. Sc., 14, 410, 1902.

Massive; as a fine granular aggregate, very brittle with flat conchoidal fracture. H. = 4. G. = 7.681. Luster metallic. Color pale pinkish brown resembling niccolite, tarnishing to a deeper brownish red.

Composition, an arsenate of copper and nickel with a small amount of cobalt (Cu,Ni,Co)<sub>2</sub>As.

Analyses:

	As	Cu	Ni	Co	Fe	
1.	36.96	39.12	17.96	0.94	tr.	quartz 4.98 = 99.96
2.	34.18	53.96	9.74	0.94	...	quartz 0.78 = 99.60
3.	[38.44]	40.72	19.42	0.82	tr.	quartz 0.60 = 100.00

B. B. fuses easily to a globule, yielding arsenical fumes and finally a metallic bead; bead reacts for cobalt, nickel and copper. Dissolves in strong nitric acid.

From the Mohawk mine Keweenaw Co., Michigan, which has afforded domeykite and mohawkite, which see. The author has also obtained synthetically the compound Cu<sub>2</sub>As, with the color and crystalline structure of chalcocite, and G. = 7.71, Am. J. Sc., 10, 443, 1900.

KIESERITE, Min., p. 932; App., p. 39. — Formation discussed; van't Hoff, Meyerhoffer and Smith, Ber. Ak. Berlin, 1034, 1901.

KILBRICKENITE, Min., p. 145. — Shown by Prior to be identical with geocronite, which see.

Kleinite. Moses, Am. J. Sc., 16, 263, 1903; Hillebrand, Am. J. Sc., 21, 85, 1906; Sachs, Ber. Akad. Berlin, 1031, 1905; Centralbl. Min., 200, 1906; Hillebrand and Schaller, Am. J. Sc., 24, 259, 1907.

Hexagonal.  $c = 1.6642$  (mean of Schaller's and Sachs's values).

Forms:  $c$  (0001),  $m$  (10 $\bar{1}$ 0),  $a$  (11 $\bar{2}$ 0),  $p$  (10 $\bar{1}$ 1),  $x$  (10 $\bar{1}$ 2). Crystals short prismatic, seldom over 1 mm. in length.

Cleavage:  $c$  good;  $m$ , poor. Brittle. H. = 3.5. G = 7.975-7.987. Color yellow to orange. Darkens on exposure to light but regains original color in the dark. Basal sections show innumerable doubly refracting individuals. Becomes normally uniaxial when heated to 130°.

Comp. — A mercury ammonium chloride of uncertain composition.

Analysis by Hillebrand of orange crystals:

Hg	Cl	SO <sub>4</sub>	N	H <sub>2</sub> O
85.86	7.30	3.10	2.57	1.03 = 99.86

**Pyr.** — In closed tube gives a little water, darkens in color and at 260°–280° mercury and calomel sublime. At higher temperature another sublimate is formed. Soluble in warm HCl and HNO<sub>3</sub> without deposition of calomel. Soluble in NH<sub>4</sub>Br with evolution of ammonia.

**Obs.** Found on the properties of the Marfa and Mariposa Mining Co., Terlingua, Texas, associated with gypsum, calcite and barite and with the other mercury minerals of the locality.

Named by Sachs after the late Prof. Carl Klein of the University of Berlin.

**KNEBELITE**, Min., p. 457; App., p. 39. — Anal. of material from Macskamező in Hungary; Kossmat and v. John, *Zs. pr. Geol.*, **13**, 305–325, 1905.

**KNOXVILLITE**, Min., p. 966. — A pale green granular saccharoidal sulphate from the Victoria gold mine, Salisbury, Tasmania, is provisionally referred here by W. F. Petterd, Notes on Minerals from Tasmania, 1902. An analysis gave:

SO <sub>3</sub>	Cr <sub>2</sub> O <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	Ign.
30.32	8.47	2.48	15.86	40.56 = 97.69

**Koenenite**. *F. Rinne*, *Centralbl. Min.*, p. 493, 1902.

Rhombohedral. In crusts showing, on the rough surface, obscure crystalline faces interpreted as belonging to an acute scalenohedron.

Cleavage highly perfect, yielding thin flexible folia, often triangular in form.

Very soft. G. = 1.98.

Color red, this color due as with carnallite, which it resembles, to minute scales of hematite.

Optically uniaxial, negative.

Composition, an oxychloride of aluminium and magnesium, probable formula: Al<sub>2</sub>O<sub>3</sub>.3MgO. 2MgCl<sub>2</sub>.8H<sub>2</sub>O (or 6H<sub>2</sub>O).

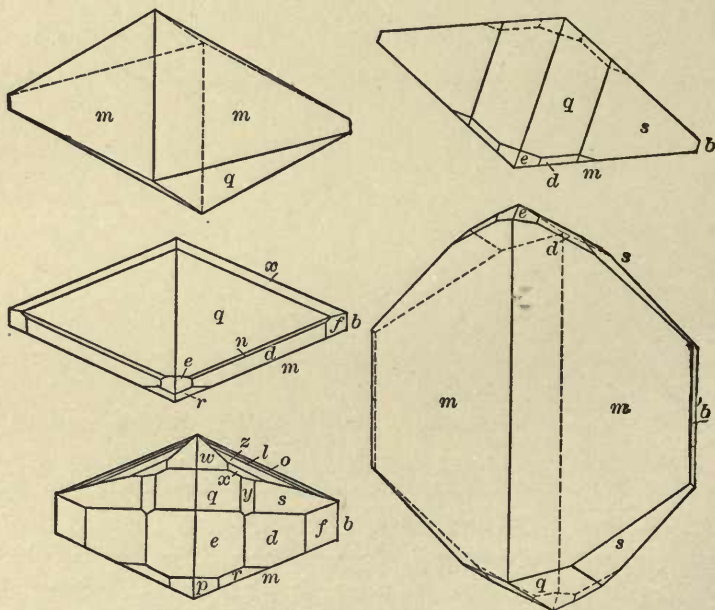
Analyses: I, Sundmacher; II, Buchholz; impurities have been deducted.

	Al <sub>2</sub> O <sub>3</sub>	MgO	MgCl <sub>2</sub>	H <sub>2</sub> O
I.	17.79	21.10	35.70	25.41 = 100
II.	18.25	23.44	36.85	21.46 = 100

Decomposed slowly by boiling water, the scales retain their form but show negative double refraction (*metakoenenite*, Rinne).

From the potash mine Justus I near Volpriehausen in the Solling; associated with halite, also with anhydrite and carnallite.

Named after Professor A. v. Koenen.



Kröhnkite, Chile.

**KRENNERITE**, Min., pp. 105, 1039; App., p. 39. — Highly modified crystals from Nagyág have yielded twenty-seven new forms and the axial ratio  $a : b : c = 0.9369 : 1 : 0.5068$ ; Smith, *Min. Mag.*, **13**, 264, 1903. Of possible occurrence, with other tellurides, at Kalgoorlie, West Australia, cf. Spencer, *ibid.*, 272.



**KRÖHNKITE**, Min., p. 958. — Crystals from Chuquicamata, Prov. of Antofagasta, Chile, described by Palache and Warren; *Am. J. Sc.*, **26**, 342, 1908; *Zs. Kr.*, **45**, 529, 1908. A new orientation was adopted by which the front and back of the crystals (as given in *Sys.*) were interchanged. Axial ratio derived =  $a : b : c = 0.5229 : 1 : 0.4357$ ,  $\beta = 56^\circ 17' 20''$ . The observed forms follow: *a* (100), *b* (010), *m* (110), *h* (120), *k* (130), *e* (011), *d* (021), *f* (031), *t* ( $\bar{1}01$ ), *u* ( $\bar{3}01$ ), *p* (111), *r* (121), *q* ( $\bar{1}11$ ), *s* ( $\bar{1}21$ ), *w* ( $\bar{2}11$ ), *x* ( $\bar{2}21$ ), *z* ( $\bar{3}31$ ), *i* ( $\bar{5}51$ ), *o* ( $\bar{1}0.10.1$ ), *y* ( $\bar{2}32$ ), *n* ( $\bar{1}32$ ). Twinning plane *c* (001). Cleavage perfect  $\parallel b$  (010), good  $\parallel e$  (011), no prismatic cleavage observed.  $G. = 2.061$ .

Refractive indices;  $\alpha = 1.5437$ ,  $\beta = 1.5775$ ,  $\gamma = 1.6013$ .  $2V_{Na} = 78^\circ 36'$  (calc.). Ax. pl.  $\parallel b$  (010).  $B_{xac}$  inclined  $48^\circ 45'$  to axis *c* in obtuse  $< \beta$ . Inclined dispersion. Anal. confirms formula.

**KRUGITE**, Min., p. 950. — Artif.; Geiger, *Ber. Ak. Berlin*, 1123, 1903; van't Hoff, *ibid.*, 566, 1906.

**Ktypeite**, App., p. 39. — Concerning the probability of its existence at Carlsbad and its artificial formation; Vater, *Zs. Kr.*, **35**, 149.

**Kunzite**, a var. of *spodumene*, which see.

**Kutnohorite**. *A. Bukovsky* [*Anz. III Congr. böhm. Naturf. u. Aerzte*, Prag, 1901, p. 293]; *Jb. Min.*, **2**, Ref., p. 338, 1903. A rhombohedral carbonate with the atomic ratios Ca : Mn : Fe : Mg = 7 : 5 : 1 : 2, occurring as reddish-white cleavage masses at Kutná Hora, Bohemia.

**LABRADORITE**, Min., p. 334. — Crystallographic, optical and chemical investigation of material found in the anorthosites from Carlton Peak, Minnesota; Winchell, *Amer. Geol.*, **26**, 220, 1900. Optical orientation; Luczizky, *Min. Mitth.*, **24**, 191, 1905. Anal. from Gleniffer Hills, south of Paisley, Renfrewshire; Houston, [*Trans. Geol. Soc. Glasgow*, **12**, 354, 1906]; *Zs. Kr.*, **45**, 304.

**Lacroisite** = rhodochrosite + rhodonite, *Chem. Ztg.*, **27**, (1), 15, 1903.

**Landerite**, a garnet, which see.

**LANGBEINITE**, App., p. 40. — From the Punjab Salt Range, India, description with analysis; Mallet, *Min. Mag.*, **12**, 159, 1899. Formation discussed; van't Hoff, Meyerhoffer and Cottrell, *Ber. Ak. Berlin*, 276, 1902. Discussion of crystalline form; Sachs, *ibid.*, 376; *Zs. Kr.*, **40**, 646.

**LARDERELLITE**, Min., p. 882. — New analyses of material from the Tuscan lagoons lead to the formula  $(NH_4)_2B_{10}O_{16} + 5H_2O$ ; d'Achiardi, *Rend. Acc. Linc.*, **9**, (1), 342, 1900.

	B <sub>2</sub> O <sub>3</sub>	(NH <sub>4</sub> ) <sub>2</sub> O	H <sub>2</sub> O	Total.
I.	71.70	9.87	[18.43]	100.00
II.	72.42	9.78	[17.80]	100.00
III.	72.06	9.83	[18.11]	100.00

**Lasallite**. *G. Friedel*, *Bull. Soc. Min.*, **24**, 12, 1901; *ibid.*, **30**, 80, 1907.

In snow-white masses, showing a fibrous structure.

$G. = 1.477$ .

Composition perhaps  $3MgO \cdot 2Al_2O_3 \cdot 12SiO_2 \cdot 8H_2O$  or  $MgO \cdot Al_2O_3 \cdot 5SiO_2 \cdot 3\frac{1}{2}H_2O$ .

Analysis of the pure material after ignition:

		SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	MgO	CaO
I.	Miramont	69.27	19.42	0.84	10.01	1.30 = 100.84
II.	Can Pey	70.28	21.64	0.38	7.56	0.24 = 100.10

Heated at  $100^\circ$  it loses 16 p. c. H<sub>2</sub>O, retaining 14.22 p. c. regarded as belonging to the mineral.

Occurs in sterile levels of the antimony mine at Miramont, France, in the concession of Souliac on the borders of Cantal and Haute-Loire. Associated with kaolinite in minute hexagonal scales, also termierite (which see) and barite. Also at Can Pey near Arles-sur-Tech.

Named after M. Lasalle, proprietor of the mines of Miramont. Author suggests that it may belong to class of compounds named by Hedde piolite (*Min.*, p. 709).

**LAUMONTITE**, Min., p. 587; App., p. 40. — Crystals from Henry Land, East Greenland; Bögild, *Medd. om Grönl.*, **28**, 128, 1905. Pseudomorph of orthoclase after laumontite from Templeton, Ottawa County, Quebec; Graham, *Am. J. Sc.*, **22**, 47, 1906.

Occurrence (with anal.) at Petersberg near Halle, Saxony; Lüdecke, Zs. für Naturwiss., **72**, 101, 1899. Occurrence with anal. from Cala Francese, island Maddalena; Rimatori, Rend. Acc. Linc., **11**, (1), 542, 1902. In granite from Montorfano, northern Italy; Tacconi, Rend. Acc. Linc., **14**, (2), 88, 1905; occurrence (with anal.) at São Paulo, Brazil; Hussak, Centralbl. Min., **331**, 1906. Anal. of material from Montecatini, Val di Cecina, and discussion of chem. comp.; Baschieri, Proc. Soc. Tosc., March, 1907.

Effect of ammonium chloride upon; Clarke and Steiger, U. S. G. S., Bull. **207**, 1902; Zs. Kr., **38**, 696.

**Laurionite**, Min., p. 171; App., p. 41. — Crystals from Laurium, Greece, studied by Smith; Min. Mag., **12**, 102. Following axial ratio derived:  $\tilde{a} : b : c = 0.7385 : 1 : 0.8346$ . New forms: *o* (112), *q* (122), *r* (132), *s* (142), *t* (152) and *u* (232). Indices of refraction:  $\alpha = 2.0767$ ;  $\beta = 2.1161$ ;  $\gamma = 2.1580$ . Ax. pl.  $\parallel b$ .  $Bx_{ac} \perp a$ . Calc.  $2V = 81^\circ 32'$ .

Doubtful new forms (292), (141), (230) with description of optical characters; Cesàro, Bull. Ac. Belg., **1198**, 1904; see also Lacroix and de Schulten, Bull. Soc. Min., **31**, 82, 1908. Crystals from Lake Como; Reossi, Rend. Acc. Linc., **15**, (1), 511, 1906.

**Lawsonite**, App., p. 41. — New forms: *r* (221), *s* (331). Analysis:

SiO <sub>2</sub>	TiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	FeO	MnO	CaO	MgO	K <sub>2</sub> O	Na <sub>2</sub> O	H <sub>2</sub> O
38.45	0.38	31.35	0.86	0.10	tr.	17.52	0.17	0.23	0.06	11.21 = 100.33

Schaller and Hillebrand, Am. J. Sc., **17**, 195, 1904. Anal. of Italian material; Zamboni, Att. Acc. Linc., **13**, (2), 466, 1904.

Occurrence with glaucophane in schists of Saint-Véran, Hautes-Alpes; Termier, Bull. Soc. Min., **27**, 265, 1904. Occurrence in California with partial analysis; Eakle, Uni. Calif. Pub., **6**, 6, 81, 1907.

**Lazulite**, Min., p. 798; App., p. 41. — From Madagascar; Lacroix, Bull. Soc. Min., **25**, 115, 1902; *ibid.*, **31**, 244, 1908.

**Lazur-Oligoclase**, see *Oligoclase*.

**Leadhillite**, Min., p. 921; App., p. 42. — Structure of mimetic crystals investigated; Mügge, Jb. Min., Beil.-Bd., **14**, 259, 1901. Crystals from Djebel-Ressas mine, Tunis; Jecker, C. R., **140**, 141, 1905; from Shultz, Ariz.; Farrington and Tillotson, Field Col. Mus., Geol. Series, **3**, No. 7, 146, 1908.

Effect of low temperatures upon optical properties; Panichi [Mem. Acc. Linc., **4**, 389, 1902]; Zs. Kr., **40**, 88.

Occurs at the Cerro Gordo mines, Inyo Co., Cal.; Rogers, Am. J. Sc., **12**, 46, 1901. From Sardinia; Pelloux, Att. Acc. Linc., **13**, (2), 34, 1904.

**Ledouxite**. *J. W. Richards*, Am. J. Sc., **11**, 457, 1901.

A copper arsenide, Cu<sub>4</sub>As, containing small amounts of cobalt and nickel from the Mohawk mine was analyzed by Ledoux (Eng. Mg. J., April 7, 1900) and called *mohawkite*. This name, however, was given by Koenig (Am. J. Sc., **10**, 440, 446, 1900, see *mohawkite*) to a variety of domeyite (Cu<sub>4</sub>As) containing cobalt and nickel. Although Koenig throws doubt on the correctness of Ledoux's analysis, this is confirmed by Richards, who gives the name *ledouxite* to the compound, Cu<sub>4</sub>As.

Ledouxite occurs in massive form, resembling algodonite in color and luster.  $G. = 8.07$ , Richards.

Analyses: 1, Richards, *l. c.*; 2, Ledoux, recalculated by Richards:

	As	Cu	Co	Ni	Fe	S	
1.	[22.8]	70.8	6.4	tr.	....	....	= 100.00
2. G. = 7.8	22.67	68.60	1.20	6.55	0.23	0.53	= 99.78

**Leesbergite**. *L. Blum*; Ann. Soc. Geol. Belg., **34**, B118, 1908. *W. Bruhns*, Mitt. Geol. Landensanst. Elsas-Lothr., **6**, 2, 303, 1908. A white chalk-like material occurring in magnetite iron ores between Marspich and Hayingen, Lorraine. Comp. originally given as 2MgCo<sub>3</sub>.CaCo<sub>3</sub> but shown by Bruhns to contain water as an essential constituent, to vary in composition and to be probably a mixture. Named in honor of Capt. Leesberg of d'Esch-sur-l'Alzette.

**Lengenbachtite**. *R. H. Solly*, Nature, **71**, 118, 1904; Min. Mag., **14**, 78, 1905; *Hutchinson*, Min. Mag., **14**, 204; Zs. Kr., **43**, 465.

Probably triclinic. In thin blade-shaped crystals, sometimes curled up like paper.

Cleavage perfect  $\parallel$  to large face of crystals. Flexible but not elastic, somewhat malleable. Soft, leaving a trace on paper.  $G. = 5.80$ , Solly; 5.85, Hutchinson. Luster metallic. Color steel-gray, often with iridescent tarnish. Streak black. Opaque.

Composition, a sulpharsenite of lead with small amounts of silver, copper and antimony, possibly  $7(\text{Pb}, (\text{Ag}, \text{Cu})_2)\text{S}_2\text{As}_2\text{S}_3$  or  $6\text{PbS} \cdot (\text{Ag}, \text{Cu})_2\text{S}_2\text{As}_2\text{S}_3$ .

Anal. by Hutchinson:

Pb	Ag	Cu	Fe	As	Sb	S
57.89	5.64	2.36	0.17	13.46	0.77	19.33 = 99.62

Occurs in the dolomite of Lengenbach quarry in the Binnenthal, Switzerland.

*Jentschite* (Koechlin, Min. petr. Mitth., **23**, 551, 1904) may be identical with lengenbachite.

LEONITE (*Kaliumbldite*), App., p. 42. — Crystals from Leopoldshall show the new forms: *b* (010), *w* (101), ( $\bar{2}11$ ); an analysis of a crystal gave

SO <sub>2</sub>	Mg	K	Cl	H <sub>2</sub> O	
52.50	6.26	21.53	0.24	19.57	=100.10

J. E. Strandmark, Zs. Kr., **36**, 461, 1902. The measured angles and analysis confirm the original results of Tenne.

Formation discussed; van't Hoff and Meyerhoffer, Ber. Ak. Berlin, 678, 1903.

LEPIDOLITE, Min., p. 624; App., p. 42. — Crystals from near Ramona, San Diego Co., Calif., studied by Schaller; Am. J. Sc., **19**, 225, 1905, showed the following forms: *c* (001), *b* (010), *a* (100), *e* (023), *o* (112), *u* ( $\bar{1}11$ ), *x* (131), *N* (261), *z* (132), *l* (130) and doubtful (223), (221), ( $\bar{1}12$ ).

Anal. of material from Brassac, Tarn, France; Arsandaux, Bull. Soc. Min., **24**, 431, 1901. Occurrence with anal., from Wakefield, Ottawa Co., Province of Quebec; Hoffmann, Am. J. Sc., **11**, 149, 1901. Occurs both of the macrodiagonal and brachydiagonal types at Haddam Neck, Conn.; Bowman, Min. Mag., **13**, 103, 1902.

Two var. known as *macro-* and *microlepidolite*, one with a large opt. ax. angle and the other with a small angle. Baumhauer, [Eclolog. geol. Helvetiæ, **7**, 354, 1903]; Min. Mag., **13**, 371, 1903.

LEPIDOMELANE, Min., p. 634; App., p. 42. — Anal. of material from nepheline-syenite, Montreal; Harrington, Trans. Roy. Soc. Canada, **11**, (3), 25, 1905.

LEPTOCHLORITE, Min., p. 643. — Description of various members of group from shell rock formation in Moravia and Silesia.

See moravite and thuringite. Kretschner, Centralbl. Min., 293, 1906.

LEUCITE Min., pp. 341, 1041; App., p. 42. — Structure of mimetic crystals investigated; Mügge, Jb. Min., Beil.-Bd., **14**, 279, 1901.

Analysis of material from Vesuvius; Casoria [Ann. R. Scuola sup. di agric. di Portici, **4**, 1, 1903]; Zs. Kr., **41**, 278. Investigation concerning its chemical constitution; Tschermak, Ber. Ak. Wien., **112**, (1), 355, 1903.

Occurrence in tufa at Pompeii; Colomba, Boll. Soc. geol. ital., **23**, 379, 1904.

Pseudo-leucite from Spotted Fawn Creek, a tributary of Twelve-mile river, Yukon Territory; Knight, Am. J. Sc., **21**, 286, 1906.

Attempt to re-form soda-leucite by heating pseudo-leucite crystals; Read and Knight, Am. J. Sc., **21**, 294, 1906.

Formation of in igneous rocks; Washington, Jour. Geol., **15**, 257, 1907.

LEUCOPHANITE, Min., p. 417. — Crystals from Kangerdluarsuk, Greenland; Böggild, Min. Grönl., 349.

Discussion of chem. comp., Cesàro, Mem. Soc. Liège, **5**, No. 6, 8, 1904.

Occurs at the Shepherd and Murphy tin-bismuth mine, Bell Mount, Middlesex, Tasmania; Petter, Notes on Tasmanian Minerals, priv. publ.

**Leucophœnicite.** S. L. Penfield and C. H. Warren, Am. J. Sc., **8**, 351, 1899.

Monoclinic. Massive, crystalline; fragments parallel to an imperfect cleavage also show indistinct cleavage cracks to which the extinction is slightly inclined.

H. = 5.5–6. G. = 3.848. Luster vitreous. Color light purplish red; slightly pleochroic, pale rose and colorless.

Composition essentially  $\text{H}_2\text{O} \cdot 7\text{RO} \cdot 3\text{SiO}_2$ , with R = Mn chiefly, also Zn and Ca. As the water is expelled at a red heat this may be written as a basic orthosilicate,  $\text{Mn}_5(\text{MnOH})_2(\text{SiO}_4)_3$ , which is analogous to a humite with hydroxyl replacing all the fluorine (cf. App. I, p. 36).

Analysis, Warren:

	SiO <sub>2</sub>	MnO	ZnO	MgO	CaO	Na <sub>2</sub> O	K <sub>2</sub> O	H <sub>2</sub> O	FeO
$\frac{1}{2}$	26.36	60.63	3.87	0.21	5.67	0.39	0.24	2.64	tr. = 100.01

B. B. fuses quietly at 3 to a brownish black globule. Yields a little water in the closed tube; reacts for manganese with the fluxes. Dissolves easily in hydrochloric acid yielding gelatinous silica upon evaporation.

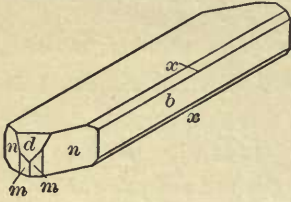
Occurs very sparingly at Franklin Furnace, N. J., intimately associated with clear light green willemite and crystals of brown vesuvianite.

Named from *λευκός*, pale, and *φοινίξ*, purple-red.

**Leucosphenite.** *G. Flink*, Medd. om Grönland, **14**, 236, 1898; **24**, 137, 1901.

Monoclinic. Axes  $a : b : c = 0.5813 : 1 : 0.8501$ ;  $\beta = 86^\circ 37'$ .

Forms:  $a$  (100),  $b$  (010),  $c$  (001),  $m$  (110),  $n$  (130),  $d$  (101),  $x$  (011),  $s$  (112),  $p$  ( $\bar{1}11$ ),  $r$  (263),  $g$  (133). Angles:  $nn''' = *120^\circ 15'$ ,  $cn = *88^\circ 19'$ ,  $cd = *53^\circ 21'$ .



Leucosphenite.

In minute wedge-shaped crystals, elongated  $\parallel a$  into rectangular prisms with  $b$ ,  $c$  prominent, also  $n$ ; faces  $c$  striated longitudinally,  $b$  also vertically. Twins common, contact twins with tw. plane  $c$  (001).

Cleavage  $b$ , distinct. Fracture uneven. Brittle.  $H. = 6.5$ .  $G. = 3.05$ , Mauzelius. Luster vitreous, on  $b$  pearly, also on  $n$  (no cleavage detected).

Color white, inclining to grayish blue. Transparent, often somewhat opaque from cracks and inclusions. Optically negative. Ax. plane nearly  $\parallel c$  and  $Bx_a \parallel a$ .

Indices:  $\alpha_r = 1.6401$ ,  $\beta_r = 1.6572$ ,  $\gamma_r = 1.6829$ ,  $\alpha_y = 1.6445$ ,  $\beta_y = 1.6609$ ,  $\gamma_y = 1.6878$ .  $\therefore 2V_a = 79^\circ 26'$  red,  $= 77^\circ 4'$

yellow. Dispersion marked  $\rho > \nu$ .

Composition,  $Na_4Ba(TiO)_2(Si_2O_3)_5$ , or somewhat analogous to petalite, related in composition and axial relation to *eudidymite*. Analysis, Mauzelius:

SiO <sub>2</sub>	TiO <sub>2</sub>	ZrO <sub>2</sub>	BaO	Na <sub>2</sub> O	K <sub>2</sub> O	H <sub>2</sub> O
56.94	13.20	3.50	13.75	11.14	0.56	0.31 = 99.40.

B. B. decrepitates and fuses with difficulty to a dark globule; not attacked by acids.

Occurs sparingly in pegmatite at Narsarsuk in southern Greenland; closely associated with ægirite, albite, epididymite, polyolithionite. Named from  $\lambda\epsilon\upsilon\kappa\acute{o}\varsigma$ , white, and  $\sigma\phi\acute{\eta}\nu$ , wedge.

**LEVERRIERITE**, Min., p. 687. — Further study on purer material gave Termier, Bull. Soc. Min., 22, 27, 1899, the following:  $G = 2.598$ ; indices,  $\alpha = 1.554$ ,  $\gamma = 1.582$ ,  $\gamma - \alpha = 0.028$ . A new analysis of the mineral from Rochebelle gave:

SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	MgO	CaO	K <sub>2</sub> O	Loss on ign.
49.90	37.02	3.65	0.30	tr.	1.13	8.65 = 100.65

**LEVYNITE**, Min., p. 595. — Crystals from Skye; Goodchild, [Trans. Geol. Soc. Glasgow, **12**, Suppl., 1-68, 1903]; Zs. Kr., **45**, 307; also Currie, Trans. Edin. Geol. Soc., **8**, 341. Crystals from East Greenland with doubtful new forms  $v$  (2.10.12.1),  $u$  (10.2.12.11) (Henry Glacier)  $c = 0.80101$ ; Böggild, Medd om Grönl., **28**, 125, 1905.

**LIBETHENITE**, Min., p. 786. — Crystallographic study by Melcher, Zs. Kr., **39**, 288, 1904. Occurs in small crystals in a quartzite gangue at the Coronado lode of the Clifton-Morenci copper district in Arizona; Lindgren and Hillebrand, Am. J. Sc., **18**, 457, 1904. Crystals from Viel-Salm, Belgium; Cesàro, Bull. Ac. Belg., **142**, 1905.

**LILLIANITE**, Min., p. 130. — Occurrence at Mt. Farrell, Tasmania; Petterd, Proc. Roy. Soc. Tasmania, 18-33, 1902.

**LIMONITE**, Min., p. 250. — Analyses of ores from Great Valley and Nittany Valley, Penn.; Hopkins, Bull. Geol. Soc. Amer., **11**, 475, 1900; Zs. Kr., **36**, 75. — Geodes from Muscogee, I. T.; Nichols, Field Columbian Mus., No. 111; Zs. Kr., **44**, 539.

**LINARITE**, Min., p. 927; App., p. 43. — Crystals from Cerro Gordo mines, Inyo Co., Calif.; Rogers, Am. J. Sc., **12**, 46, 1901; from Cumberland with new form,  $(\bar{1}2.2.11)$ ; Cesàro, Bull. Ac. Belg., **328**, 1905; from Eureka, Utah, with new forms,  $\delta$  (10.0.9),  $\phi$  (9.0.10)  $f$  (523); Farrington and Tillotson, Field Col. Mus., **3**, No 7, 148, 1908.

Occ. in Sardinia; Pelloux, Att. Acc. Line., **13**, (2), 34, 1904; in County Wicklow, Ireland; Russell, Min. Mag., **14**, 348, 1907; in the Otavi district, German S. W. Africa, see *otavite*.

**LINNÆITE**, Min., p. 78. — Auriferous variety (anal.) from Santa Fé mine, Chiapas, Mexico; Collins, Min. Mag., **13**, 361.

**LISKEARDITE**, Min., p. 846. — Mineral similar in character found at Cape Garonne, near Hyères, France; Lacroix, Bull. Soc. Min., **24**, 27, 1901.

**Liveingite.** *R. H. Solly* and *H. Jackson*; Proc. Cambridge Phil. Soc., **11**, 239, 1901; Min. Mag., **13**, 160.

Monoclinic.  $\beta = 89^\circ 45\frac{1}{2}'$ .

Comp.  $5PbS.4As_2S_3$ .

Anal.: Pb, 47.58; S, 24.91; As, 26.93 = 99.42.

From the Binnenthal.

**Loaisite.** *R. L. Codazzi*, [Mineralizadores y minerales metalicos de Colombia. Tralajos de la Oficina de Historia Natural. Seccion de min. y geol. Bogota, 1905]; Centralbl. Min., 183, 1908. A new mineral found at Marmato, Colombia, with following analysis:

As <sub>2</sub> O <sub>5</sub>	FeO	PbO	H <sub>2</sub> O
49.6	34.3	0.4	16.9 = 101.2

**LORANDITE**, App., p. 43. — Analyses 1, 2 by P. Jannasch on material measured by Goldschmidt, (Zs. Kr., 39, 122, 1903), also 3 by J. Loczka, *ibid.*, p. 520.

	S	As	Tl	Gangue
1.	19.26	21.65	58.75	0.08 = 99.74
2.	18.75	21.32	59.08	0.12 = 99.27
3. G. = 5.533 ( $\frac{2}{3}$ )	18.99	22.30	59.76	= 101.05

**Loranskite.** *M. Melnikow*, [Loranskite a new Mineral, sep. pub., St. Petersburg]; Zs. Kr., 31, 505; Nikolajew [Verh. russ. min. Gesells., 35, 11-13, 1897]; Zs. Kr., 31, 505.

Massive. Metallic. Color black; streak greenish gray. H. = 5. G. = 4.6. Isotropic. Infus. Analysis:

Ta <sub>2</sub> O <sub>5</sub>	Y <sub>2</sub> O <sub>3</sub>	Ce <sub>2</sub> O <sub>3</sub>	CaO	FeO	ZrO <sub>2</sub>	Ig.
47.00	10.00	3.00	3.30	4.00	20.00	8.15 = 95.45

Occ. Found at Imbilax near Pitkäranta, Finland. Named after A. Loranski.

**Lorenzenite.** *G. Flink*, Medd. om Grönland, 14, 250, 1898; 24, 130, 1901.

Orthorhombic. Axes  $\tilde{a} : \tilde{b} : \tilde{c} = 0.6042 : 1 : 0.3592$ .

Forms:  $a$  (100),  $b$  (010),  $m$  (110),  $n$  (120),  $x$  (1.12.0),  $p$  (111),  $o$  (231). Angles:  $120 \wedge 120 = 100^\circ 47'$ .  $110 \wedge 111 = 55^\circ 13'$ .

In minute acicular crystals with the prisms  $n$ , or  $m, n$ , prominent and terminated chiefly by  $p$ .

Cleavage  $n$  (120) distinct. Brittle. H. = 6-6.25. G. = 3.42, Mauzelius. Luster adamantine brilliant. Colorless or with tinge of violet or brown; also in part with dark ends from enclosed impurities. Transparent to translucent.

Optically +. Ax. pl.  $\parallel a$ .  $Bx_a \perp b$ . Absorption  $\tilde{a} > \tilde{b} > \tilde{c}$ .  $2E = 72^\circ$ . Indices:  $\alpha_r = 1.7320$ ,  $\gamma_r = 1.7786$ ;  $\alpha_y = 1.7785$ ,  $\gamma_y = 1.7876$ .

Composition, Na<sub>2</sub>(TiO)<sub>2</sub> Si<sub>2</sub>O

Analysis by Mauzelius:

SiO <sub>2</sub>	TiO <sub>2</sub>	ZrO <sub>2</sub>	Na <sub>2</sub> O	K <sub>2</sub> O	H <sub>2</sub> O
34.26	35.15	11.92	17.12	0.37	0.77 = 99.59.

B. B. fuses easily to a black globule; not attacked by acids.

Occurs in drusy cavities in pegmatite at Narsarsuk, southern Greenland; associated minerals are aegirite, microcline, albite, arfvedsonite, elpidite, etc.

Named after the Danish mineralogist, Johan Lorenzen.

**Lotrite.** *G. Munteanu-Murgoci*, [Inaug.-Diss., Munich, 1901]; Zs. Kr., 36, 650; Bull. Soc. Min., 24, 504, 1901.

Massive, in an aggregate of small grains and leaves. Cleavage  $\parallel$  to greatest length. H. = 7.5. G. = 3.23. Green. Optically +.  $n = 1.67$ ;  $\gamma - \alpha = 0.014$ . Extinction makes angle  $28^\circ$  to trace of cleavage. Ax. pl. transverse to length of lamellæ and  $\perp$  to cleavage.  $c \parallel b$ .  $2E = 30^\circ$ ;  $2V = 18^\circ$  (approx.).

Comp. —  $4SiO_2 \cdot 2(Al, Fe)_2O_3 \cdot 3(Ca, Mg)O \cdot 2H_2O$ . Analysis:

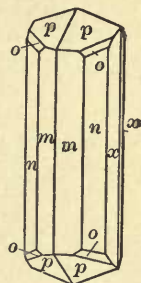
SiO <sub>2</sub>	$\frac{Al_2O_3 \ Fe_2O_3}{30.90}$	FeO	CaO	MgO	H <sub>2</sub> O
38.02		0.33	23.56	2.80	6.24 = 101.85

Occ. Found in small veins in a chlorite schist associated with epidote, zoisite, clinozoisite, garnet, etc., in valley of the Lotru, Transylvania. Named from locality of occurrence.

**LÖWEITE**, Min., p. 946. — Conditions of formation discussed; van't Hoff and O'Farely, Ber. Ak. Berlin, 370, 1902.

**LUSSATITE**, Min., p. 197. — Probably a fibrous form of tridymite; Slavik, Centralbl. Min., 690, 1901. Anal. from Bojanovic, Westmähren, Bohemia; Kovár, [Chem. Blätter, Prag, 233, 1901]; Zs. Kr., 37, 500.

LUZONITE, see *Enargite*.



Lorenzenite.

MACKINTOSHITE, App., p. 44. — Radio-activity from Barringer Hill, Llano Co., Texas; Hidden, Am. J. Sc., **19**, 430, 1905; see also under *Uraninite*.

MAGNESITE, Min., p. 274; App., p. 44. — Analyses of gray and white varieties from Jolsva, Hungary; Loczka, Zs. Kr., **35**, 282, 1901. Magnesite deposits of California with anal., etc.; Hess, Bull. U. S. G. S., **355**, 1908.

A magnesium carbonate containing isomorphous  $MnCO_3$ ,  $FeCO_3$  and  $CoCO_3$  from Eisefeld near Siegen, Westphalia, having following analysis:

MgO	MnO	FeO	CoO	CO <sub>2</sub>	H <sub>2</sub> O
33.41	7.50	6.50	5.12	46.77	0.31 = 99.61

Johnsen, Centralbl. Min., **13**, 1903.

Also see *Dolomite*.

**Magnesiumpectolite**, see under *Pectolite*.

MAGNETITE, Min., pp. 224, 1041; App., p. 44. — Crystals from Narsarsuk, Greenland; Flink, Medd. om Grönl. **14**, 234, 1898; **24**, 23, 1901; from Pian Real, Piedmont; Boeris, Att. Acc. Torino, **38**, 691, 1903.

Analyses of magnetites containing Ti and V from eastern Ontario, Canada; Pope, Trans. Amer. Inst. Min. Eng., **29**, 372, 1899; Zs. Kr., **35**, 295; of titanomagnetite from Croustet, near Puy, Haute-Loire; Arsandaux, Bull. Soc. Min., **24**, 475, 1901; of magnetite from St. Joseph du Lac, Quebec, Canada, containing 5.32%  $TiO_2$ , 8.46% MnO and 3.24% MgO; also from Magnet Cove, Arkansas; Digby, Nova Scotia, with discussion of isomorphous relations; Harrington, Min. Mag., **14**, 373, 1907.

Formation of; Bruhns, Zs. prakt. Geol., **12**, 212, 1904; occurrence in garnet rock at Daschkesan, Caucasus; Jaczewski [Verh. russ. min. Ges., **42**, 75, 1905]; Zs. Kr., **43**, 69.

MALACHITE, Min., p. 294; App., p. 44. — New form (423) found on crystals from Likasi mine, Katanga, Congo; Cesáro, Bull. Ac. Belg., 1206, 1904; crystals from same locality; Buttgenbach, Ann. Soc. Géol. Belg., **31**, M 565, 1905; crystals associated with diopside from Mindouli, French Congo; Lacroix, Bull. Soc. Min., **31**, 253, 1908.

MAMANITE, Min., p. 950. — Identical with *polyhalite*. Analysis given. Van't Hoff and Voerman, Ber. Akad. Berlin, 984, 1904.

MANGANITE, Min., p. 248; App., p. 45. — Crystals from Ilefeld with new forms, *E* (320), *L* (940), *R* (560), *U* (590); Zambonini, Zs. Kr., **34**, 229. From Sandur Hills, India; Fermor, [Rec. Geol. Sur. India, **33**, 229, 1906]; Zs. Kr., **45**, 308.

MANGANOCALCITE, Min., p. 269. — Anal. from a graphite mine at Gross-Tresny, Mähren, Bohemia; Kovář [Abh. böhm. Akad., **28**, 1899]; Zs. Kr., **34**, 705. See under *Agnolite*.

**Manganosparite, Manganospherite.** *K. Busz*, Jb. Min., **2**, 129, 1901. — See *Siderite*.

**MANGANOTANTALITE**, see under *Columbite*.

MARCASITE, Min., pp. 94, 1041; App., p. 45. — Crystals from Rondout, Ulster Co., N. Y.; Whitlock, N. Y. State Mus., Bull. **98**, 1905; Zs. Kr., **43**, 393.

Containing small amount of thallium from Galmei mines, Poland; Antipoff, [Jour. russ. phys. chem. Ges., St. Petersburg, **28**, 384, 1896]; Zs. Kr., **31**, 515. Anal. of material from sandstone of Calafuria, Italy; Manasse, [Att. Soc. Tosc., **21**, 159, 1905]; Zs. Kr., **43**, 496.

Method of quantitative determination of amounts of marcasite and pyrite in mixtures; Stokes, Am. J. Sc., **12**, 414, 1901; Bull. U. S. Geol. Sur., **178**, 1901; Zs. Kr., **37**, 81.

**Marignacite.** *S. Weidman* and *V. Lenher*, Am. J. Sc., **23**, 287, 1907.

A variety of pyrochlore. Crystals octahedrons. Color light yellowish brown.  $G = 4.13$ ,  $H = 5-5.5$ . Analysis:

Nb <sub>2</sub> O <sub>5</sub>	Ta <sub>2</sub> O <sub>5</sub>	SiO <sub>2</sub>	TiO <sub>2</sub>	Fe <sub>2</sub> O <sub>3</sub>	FeO	Ce <sub>2</sub> O <sub>3</sub>	Y <sub>2</sub> O <sub>3</sub>	ThO <sub>2</sub>	CaO	MgO	Na <sub>2</sub> O	K <sub>2</sub> O	H <sub>2</sub> O
55.22	5.86	3.10	2.88	0.50	0.02	13.33	5.07	0.20	4.10	0.16	2.52	0.57	6.40 = 99.93

Occurs in pegmatite 9 miles N. E. of Wausau, Wisconsin. Named in honor of the chemist Marignac.

**Marrite.** *R. H. Solly*, Min. Mag., **14**, 76, 1905, 188, 1906.

Monoclinic. Axes  $a : b : c = 0.57634 : 1 : 0.47389$ ;  $\beta = 88^\circ 45'$ . Angles (100) : (001) =  $88^\circ 45'$ ; (010) : (110) =  $60^\circ 3'$ ; (010) : (011) =  $64^\circ 39'$ .

Forms: *a* (100), *b* (010), *c* (001), (720), (310), (210), (320), (110), (230), (120), (130), (140), (150), (170), (201), (013), (012), (023), (011), (021), (073), (083), (031), (072), (041), (111), (112), (223), (111), (312), (212), (211), (121), (131), (151), (271), (211), (233), (121).

Habit roughly cubical with *a*, *b*, *c* prominent, modified by numerous domes and pyramids; also tabular.

Cleavage not observed. Fracture conchoidal. Brittle. *H.* = 3. Luster metallic, brilliant. Color lead- to steel-gray, often with iridescent tarnish. Streak black with chocolate tinge.

Composition not determined.

Occurs very sparingly in the white dolomite of the Lengenbach quarry, Binnenthal, Switzerland, associated with lengenbachite and rathite.

Named after Dr. John E. Marr of Cambridge, England.

MARSHITE, App., p. 45. — Description of specimens from Broken Hill, N. S. W., give following additional data. Dodecahedral cleavage. *H.* = 2.5.  $n_{Na} = 2.346$ . Spencer, *Min. Mag.*, **13**, 38. Analysis on material with *G.* = 5.590; Prior, *ibid.*, 189.

The identification of small quantities of iodine in New South Wales copper ores suggests the probable presence of marshite; A. Dieseldorff, *Proc. Roy. Soc. N. S. W.*, **33**, 160, 1899.

Marsjatskite. *E. von Fedorow* and *W. Nikitin*, [*Ann. Géol. Min. Russie*, **3**, 90, 102, 1899]; *Min. Mag.*, **12**, 387. Glauconite containing much manganese, forming the bulk of a Tertiary sandstone in the Marsjat forest, Urals.

MATLOCKITE, *Min.*, p. 169. — Crystals from Laurium, Greece; Lacroix and de Schulten, *Bull. Soc. Min.*, **31**, 85, 1908.

Refractive indices; Buttgenbach, *Ann. Soc. géol. Belg.*, **33**, M11, 1906.

Mayberyite. S. F. Peckham, [*Jour. Franklin Inst.*, **140**, 382, 1895], *Min. Mag.*, **12**, 387. Name proposed in connection with a suggested new classification of petroleum, bitumen, etc., after C. F. Mabery (not Maybery).

MEIONITE, *Min.*, p. 467. — A mineral occurring in amphibole-gneiss from the Black Forest which has the microscopical characters of meionite except that it shows a basal cleavage, has been called *pseudomeionite*; Rosenbusch, [*Mitt. Grossherz. Badisch. geol. Landanst.*, **4**, 391, 1902]; *Min. Mag.*, **14**, 408, 1907.

Melanochalcite. *G. A. Koenig*, *Am. J. Sc.*, **14**, 404, 1902.

Massive, occurring as a pitchy black layer a few millimeters in thickness over a nucleus of cuprite, this kernel being surrounded by a banded green zone of chrysocola and malachite and this again by quartz, the whole forming nodules having an average diameter of 120 mm. and of much beauty in the cross section. The black mineral when pure has a brilliant luster and is very brittle; *H.* = 4; *G.* = 4.141.

Analysis of carefully selected material.

SiO <sub>2</sub>	CO <sub>2</sub>	CuO	ZnO	Fe <sub>2</sub> O <sub>3</sub>	H <sub>2</sub> O
7.80	7.17	76.88	0.41	0.07	7.71 = 100.04

See also analysis of copper pitch ore from Morenci, Arizona; Lindgren and Hillebrand, *Am. J. Sc.*, **18**, 454, 1904.

MELANOPHLOGITE, *Min.*, pp. 194, 1041; App., p. 45. — Study of optical properties; Zambonini, *Zs. Kr.*, **41**, 48.

MELANTERITE, *Min.*, p. 941; App., p. 46. — Crystals from Falun, Sweden, described and analyzed; Edgren, *G. För. Förh.*, **23**, 329, 1901. Occurs in small prismatic crystals, also as an efflorescence with pyrite near Leona Heights, Alameda Co., Cal., new forms noted *l* (120), *d* (102), *k* (203), *x* (302), *q* (201), *j* (904), *B* (332); Schaller, *Bull. G. Univ. Cal.*, **3**, 195, 1903.

Study of chemical constitution and genesis of iron sulphates; Scharizer, *Zs. Kr.*, **35**, 345.

Occurrence in Baluchistan, India; Hooper [*Jour. Asiatic Soc. Bengal*, **72**, 236, 1901]; *Zs. Kr.*, **42**, 391; occurrence at Cetine, Siena, Italy (with anal.); Manasse, *Proc. Soc. Tosc.*, May, 1908.

MELILITE, *Min.*, p. 474; App., p. 46. — Indices of refraction for various colors; Hlawatsch, *Min. Mitth.*, **23**, 415, 1904.

Study of minerals of melilite group with analyses; Fouqué, *Bull. Soc. Min.*, **23**, 10, 1900; chemical composition with analyses; Zambonini, *Zs. Kr.*, **41**, 226.

MELINITE, *Min.*, p. 695. — From Vicz near Bistritz, Mähren, with anal.; Kovář, [*Chem. Blätter*, 1899]; *Zs. Kr.*, **34**, 706.

MELIPHANITE, *Min.*, p. 418. — Chem. comp. discussed; Cesàro, *Mem. Soc. Liège*, **5**, No. 6, 11, 1904.

**Melite.** *F. Zambonini*, *Zs. Kr.*, **32**, 161, 1899; **34**, 227, 1901.

In imperfect prismatic forms; also stalactitic massive.

H. = 3. G. = 2.18. Color bluish brown. Opaque.

Composition approximates to  $2(\text{Al,Fe})_2\text{O}_3 \cdot \text{SiO}_2 \cdot 8\text{H}_2\text{O}$ .

Analysis.

SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	CaO	H <sub>2</sub> O
14.97	35.24	14.90	0.78	33.75 = 99.64

B. B. infusible, gives off water and the residue becomes brown; iron reactions with the fluxes. Completely soluble in hydrochloric acid with separation of silica.

The specimen examined, originally from the Abbat collection, was labeled allophane from Saalfeld, Thuringia.

Named after Professor Romolo Meli of Rome.

MELONITE, *Min.*, p. 76.— Anal. from Worturpa, N. S. W.; Higgin, [*Trans. Roy. Soc. So. Aus.*, **23**, 211, 1899]; *Zs. Kr.*, **34**, 214.

Analyses by Hillebrand, *Am. J. Sc.*, **8**, 295, 1899, from original locality, Stanislaus mine, Melones Co., Calif., and by Dieseldorff, *Centralbl. Min.*, 168, 1901, from Australia, prove that formula should be NiTe<sub>2</sub>.

	I	II	III	IV	V
Te	80.75	81.40	80.17	81.09	81.31
Ni	18.31	18.60	16.73	18.91	18.69
Co		.....	0.75	.....	.....
Ag	0.86	.. ..	Fe 1.33	.....	.....
	99.92	100.00	98.98	100.00	100.00

I, Hillebrand; II = I recal.; III, Dieseldorff; IV = III recal.; V = Theory for NiTe<sub>2</sub>.

Occurrence at Illinawortina, N. S. W., with analyses; Dieseldorff, *Centralbl. Min.*, 98, 1900.

MERCURIC IODIDE. Minute scarlet-red cubes occurring in limonite at the Broken Hill mines, New South Wales, have been identified as probably mercuric iodide by Moses; its relation to the doubtful coccinite of Castillos (*Min.*, p. 161) is uncertain, *Am. J. Sc.*, **12**, 98, 1901.

MERCURY, *Min.*, p. 22. — Occurrence at Erzberg, Styria; Redlich, *Centralbl. Min.*, 280, 1908.

MESOLITE, *Min.*, p. 605.— Optical study of material from Faroe islands; Görgy, *Min. Mitth.*, **27**, 255, 1908.

**Anal.** — From Table Mountain, Golden, Colo.; Patton, *Bull. Geol. Soc. Amer.*, **11**, 461, 1900; *Zs. Kr.*, **36**, 74; from Ben Lomond, N. S. W.; Anderson, *Rec. Aus. Mus.*, **6**, 419, 1907; from basalt of Montresta, Sardinia; Deprat, *Bull. Min. Soc.*, **31**, 191, 1908; also, Millosevich, *Rend. Acc. Linc.*, **17**, (1), 270, 1908; and Pelacani, *ibid.*, **17**, (2), 66, 1908.

Discussion of chem. comp.; Zambonini, *Mem. Acc. Sci. Napoli*, **14**, 121, 1908.

A zeolite having composition and general physical properties like mesolite but differing optically has been named *pseudomesolite* by A. N. Winchell, [*Thèse Fac. des Sc. de Paris*, 1900]; *Bull. Soc. Min.*, **24**, 506, 1901; *Amer. Geol.*, **26**, 275, 1900; biaxial, positive, small axial angle; length of fibers positive; max. angle of extinc. to length of fibers = 20°. Analysis:

SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	MgO	CaO	Na <sub>2</sub> O	K <sub>2</sub> O	H <sub>2</sub> O
45.25	25.69	1.40	tr.	9.75	4.24	0.47	12.99 = 99.79

Found in the anorthosite of Carlton Peak, Minnesota.

Experiments concerning loss of water, etc.; Friedel, *Bull. Soc. Min.*, **22**, 84, 1899.

METACINNABARITE, *Min.*, pp. 62, 1041; *App.*, p. 46. — Relations to cinnabar, which see.

**Metanhydrite.** *E. Sommerfeldt*, *Jb. Min.*, **1**, 140, 1907.

Orthorhombic. Composition, CaSO<sub>4</sub>.

Prepared artificially in small crystals which show faces that cannot be simply referred to the anhydrite axes. Like anhydrite in cleavage and specific gravity. Differs in showing a distortion of the interference figure. Perhaps to be considered as isomorphous with barite, to the crystal axes of which its faces could be referred.

**Metakalkuranite**, see *Autunite*.

**Metakoenenite.** *F. Rinne*, *Centralbl. Min.*, p. 498, 1902. — See *Koenenite*.

**Metakupferuranite**, see *Torbernite*.



**META-VOLTINE**, Min., p. 972. — Formed at eruption of Vesuvius, 1906; anal. given; see under Vesuvius.

Occurrence in a fumarole near Pyromeni on island of Milo, and near Porto di Levante on Vulcano; Lacroix, Bull. Soc. Min., **30**, 30, 1907. From Zolfo Grotto, Miseno, Italy; Zanbonini, Rend. Acc. Sci. Napoli, Dec., 1907.

**METEORITES**, see under *Iron*.

**MIARGYRITE**, Min., p. 116. — Crystals from Zacatecas, Mexico, with following new forms: *T* (106), *U* (1.0.30), *V* (1.0.12), *W* (1.0.12), *P* (15.2.2), *K* (112), *H* (411), *Z* (913); Eakle, Zs. Kr., **31**, 209. Description of specimens from Tatasi (anal.), and from Aullagas, Potosi, Bolivia; Spencer, Min. Mag., **14**, 339, 340.

**MICA GROUP**, Min., p. 611; App., p. 46. — Analyses of Canadian micas; Egleson, Trans. Roy. Soc. Canada, **10**, (3), 57, 1904; from marble of Carrara; D'Achiardi, Att. Soc. Tosc. Sc., Mem. **22**, 1906.

Description of occurrence in the pegmatites of upper Veltlin; Linck, [Zs. f. Naturwiss. Jena, **33**, 345, 1899]; Zs. Kr., **35**, 317. Occurrence in Canada; Cirkel, Bull., of Mines Branch, Dept. of Interior, Ottawa, Canada; Am. J. Sc., **21**, 405, 1906.

**MICROCLINE**, Min., pp. 322, 1042; App., p. 47. — Occurs in crystals at Haddam Neck, Conn.; Bowman, Min. Mag., **13**, 114, 1902. Crystals from various Greenland localities; Böggild, Min; Grönl., 443; from Vizézy near Montbrison, Loire; Gonnard, Bull. Soc. Min., **28**, 17, 1905.

Analysis from Ilmengebirge; Sioma, Zs. Kr., **34**, 278.

In granites of Sardinia, see under *Orthoclase*.

**MICROLITE**, Min., pp. 728, 1042; App., p. 47. — From Narsarsuk, Greenland; Flink, [Medd. om Grönl., **16**, 234, 1898; **24**, 171, 1901].

**MICROSOMMITE**, Min., p. 428. — Refractive indices of crystals formed during eruption of Vesuvius in 1906; see under *Vesuvius*.

**MIERSITE**, App., p. 47. — Description of; Spencer, Min. Mag., **13**, 41. Anal. by Prior, *ibid*, **188**, gave Ag, 38.17; Cu, 5.64; I, 56.58 = 100.39, which leads to formula,  $4AgI.CuI$ .  $G = 5.64$ .

**MILARITE**, Min., p. 312; App., p. 47. — Crystals from Gletsch, Switzerland; Busz, Centralbl. Min., 754, 1906.

Chem. comp. discussed; Cesàro, Mem. Soc. Liège, **5**, No. 6, 1, 1904.

**MILLERITE**, Min., p. 70; App., p. 47. — Study by Palache and Wood, of crystals from Orford, Quebec, Am. J. Sc., **13**, 343, 1904, gave following new facts using as according to Gdt.,  $c = 0.3774$  (Palache); (0112) is a gliding plane and artificial twins can be formed; perfect cleavage  $\parallel$  to (1011) and (0112); new forms: (7290), (0221), (2131), (4153) with several doubtful forms.

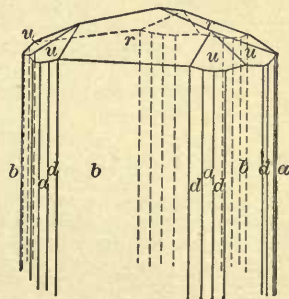
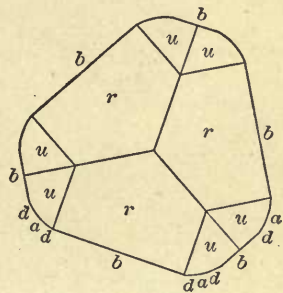
**MIMETITE**, Min., p. 771. — Crystals from Bena a Padru, Sardinia; Lovisato, Rend. Acc. Linc., **13**, (2), 43, 1904; from Eureka, Utah; Farrington and Tillotson, Field Col. Mus., Geol. Series, **3**, No. 7, 150, 1908. Study of refractive indices; Bowman, Min. Mag., **13**, 324, 1903.

**MINERVITE**, App., p. 47. — A white pulverulent phosphate from the Jenolau caves, New South Wales, is analyzed by Mingaye and referred to minervite. Trans. Austr. Assoc. Sci., **7**, 1898. Analyses of other phosphatic deposits are also given.

**MIRABILITE**, Min., p. 931. — Occurrence with gypsum at Puchberg near Schneeberg, Austria; Cornu, Centralbl. Min., 280, 1908.

**MISENITE**, Min., p. 922. — Anal. of material from Zolfo Grotto, Miseno, Italy, corresponding to formula,  $K_2SO_4.6HKSO_4$ ; Zanbonini, Rend. Acc. Sci. Napoli, Dec., 1907.

**MISSONITE**, Min., p. 471; App., p. 47. — Variety dipyre occurs altered to forsterite and spinel in lherzolite at Ariège; Lacroix, Bull. Soc. Min., **24**, 14, 1901.



Millerite, Orford, Quebec.

**Mohawkite.** *G. A. Koenig*, *Am. J. Sc.*, **10**, 440, 1900. — A variety of domeykite containing nickel and cobalt. See *Domeykite*; also *Ledouxite*.

**Mohawk-Whitneyite.** *G. A. Koenig*, *Am. J. Sc.*, **10**, 446, 1900; **14**, 414, 1902. — An intimate mixture of mohawkite and whitneyite, see *Whitneyite*.

MOHSITE, see *Ilmenite*.

**Moissanite.** *G. F. Kunz*, *Am. J. Sc.*, **19**, 396, 1905. — Name proposed for the naturally occurring carbon silicide (CSi) (*Carborundum*) found by Moissan as small green hexagonal plates in the meteoric iron of Cañon Diablo, Arizona, associated with microscopic diamonds. Moissan, *C. R.*, **139**, 778, 1904; **140**, 405, 1905.

Crystallization of carborundum. *G. B. Negri*, *Riv. min. crist. ital.*, **29**, 33, 1903; *Zs. Kr.*, **41**, 269, 1905. Rhombohedral. Forty-four forms were observed, of which the following are given as the most common: (0001), (10 $\bar{1}$ 0), (10 $\bar{1}$ 1), (4043), (20 $\bar{2}$ 1), (4041), (01 $\bar{1}$ 1), (0443), (0 $\bar{2}$ 21), (0441).

Angles: 0001  $\wedge$  10 $\bar{1}$ 1 = 54° 46' 37", 0001  $\wedge$  40 $\bar{4}$ 3 = 62° 5' 53", 0001  $\wedge$  20 $\bar{2}$ 1 = 70° 33' 23", 0001  $\wedge$  4041 = 79° 59' 31".

Crystal habit is (1) tabular || (0001), or (2) pyramidal, rhombohedrons of both orders being present.

Following facts observed under the microscope by Pirsson [priv. contr.]. Cleavage poor, rhombohedral; fracture conchoidal. Uniaxial, positive; double refraction weak. Somewhat pleochroic,  $\epsilon$  deep indigo blue,  $\omega$  light blue. Refractive indices high; both  $\omega$  and  $\epsilon$  greater than 1.75.

**Moldavite**, a glass. — Occurrence in Mähren; Dvorský [*Mus. Franciscum-Annalen*, Brünn, 1898]; *Zs. Kr.*, **32**, 623. Concerning its origin; Suess [*Ver. geol. Reichsanst. Vienna*, 387, 1898; Rzehak, *ibid.*, 415]; its occurrence in northern Bohemia; Jahn, [*ibid.*, 81, 1899]; all reviewed in *Zs. Kr.*, **33**, 649. Chemical composition; John [*Verh. geol. Reichsanst. Vienna*, 179, 1899]; *Zs. Kr.*, **35**, 309.

MOLYBDENITE, *Min.*, pp. 41, 1042; *App.*, p. 47. — Crystallographic study; Moses, *Am. J. Sc.*, **17**, 359, 1904.

Anal. from Biella, Italy; Zambonini, *Zs. Kr.*, **40**, 211.

Alpine occurrences; Lincio, *Centralbl. Min.*, **12**, 1905. In basalts of lower Rhine; Brauns, *Centralbl. Min.*, **97**, 1908.

MOLYBDITE, *Min.*, p. 201. — Analyses by Schaller, *Am. J. Sc.*, **23**, 297, 1907; *Zs. Kr.*, **43**, 331, of various specimens show that molybdic ochre is not the oxide MoO<sub>3</sub> but rather a hydrous ferric molybdate, Fe<sub>2</sub>O<sub>3</sub>·3MoO<sub>3</sub>·7½H<sub>2</sub>O. Results confirmed by Guild, *Am. J. Sc.*, **23**, 455, 1907, except his analysis gives formula with 7H<sub>2</sub>O. Anal. I, Schaller; II, Guild.

	H <sub>2</sub> O	Fe <sub>2</sub> O <sub>3</sub>	MoO <sub>3</sub>	Insol.	
I. Westmoreland, N. H.	17.62	21.08	57.69	4.66	= 101.05
II. Santa Rita Mts., Ariz.	17.36	21.84	60.80	....	= 100.00*

\* Recalc. after deducting insol. res.

Anal. of material from Hortense, Colo.; Schaller, *Am. J. Sc.*, **25**, 74, 1908; *Zs. Kr.*, **44**, 12.

**Molybdophyllite.** *G. Flink*, *Bull. G. Inst. Upsala*, **5**, 91, 1901.

Hexagonal. In irregular foliated masses with perfect basal cleavage; resembles mica. Somewhat flexible in thin folia; etching figures normal hexagonal (Baumhauer). H. = 3-4. G. = 4.717. Luster on *c* pearly, elsewhere vitreous. Colorless in thin folia, in thicker masses pale green. Optically uniaxial, negative. Indices  $\omega_y = 1.8148$ ,  $\epsilon_y = 1.7611$ .

Composition, RSiO<sub>4</sub> + H<sub>2</sub>O with R = Pb : Mg = 1 : 1 nearly. Cf. barysilite, *Min.*, p. 421. Analysis, Flink, i.e.:

SiO <sub>2</sub>	PbO	MgO	Al <sub>2</sub> O <sub>3</sub>	Na <sub>2</sub> O	K <sub>2</sub> O	H <sub>2</sub> O
18.15	61.09	11.71	0.46	0.82	0.69	6.32 = 99.24

B. B. fuses with some difficulty to a gray porcelain-like mass, which yields metallic lead with soda on charcoal. Yields water freely in the tube.

Occurs with hausmannite in granular limestone or dolomite at Långban, Sweden.

Named from *μόλυβδος*, lead, and *φύλλον*, leaf, in allusion to its structure.

MONAZITE, *Min.*, p. 749; *App.*, p. 47. — **Cryst.** — Description of crystals with optical and chemical investigation from Impilaks, Finland; Ramsay and Zilliacus, [*Öfversikt af Finska Vetenskaps-Societetens Förhandlingar*, **39**, 1897]; *Zs. Kr.*, **31**, 317; crystals from Tyrol; Cathrein, *Jb. Min.*, **2**, 137, 1899; from Pisek, Bohemia; Krejci, *Ber. böhm. Ges. Wiss.*, xlv, 1899; also *Bull. Acad. Sci. Bohême*, 1904; crystallography with bibliography; Bowman, *Zs. Kr.*, **33**, 113,

1900; crystals from Tintagel, Cornwall, with new forms,  $\mu$  (130),  $\eta$  ( $\bar{1}32$ ),  $\theta$  ( $\bar{1}22$ ); Bowman, *Min. Mag.*, **12**, 358, 1900; from Prägratten, Tyrol; Pohl, *Min. Mitth.*, **22**, 472, 1903; from Kekertak, Upernivik District, Greenland; Böggild, *Min. Grönl.*, 202; from Emmaville, N. S. W.; Anderson, *Rec. Aus. Mus.*, **6**, 414, 1907.

Opt. study of crystals from Nil-Saint-Vincent, Brabant; Prinz, *Bull. Ac. Belg.*, 313, 1904.

**Anal.** — From Pisek, Bohemia; Preis, [*Ber. böhm. Ges.*, **19**, 1897]; *Zs. Kr.*, **31**, 526; Brazil with discussion of composition; Hussak and Reitingen, *Zs. Kr.*, **37**, 550, 1903. Concerning presence of thorium; Mann, *Inaug.-Diss.*, Leipzig, 1904; *Zs. Kr.*, **42**, 664. Analyses of material from Idaho (?); Tschernik [*Verh. russ. min. Ges.*, **42**, 9, 1905], *Zs. Kr.*, **43**, 68. Discussion of analyses; Aars [*Inaug.-Diss.*, Freiburg i. Br. 1905]; *Centralbl. Min.*, 247, 1907.

General notes; Derby, *Am. J. Sc.*, **10**, 217, 1900. Radioactivity; Barker, *Am. J. Sc.*, **16**, 161, 1903.

**Occ.** — In tin gravels, Embabaan district, Swaziland, S. Africa; Prior, *Min. Mag.*, **12**, 101, 1899; from Delaware Co., Pa.; Hamilton, [*Proc. Phil. Ac. Sc.*, **11**, 377, 1899]; *Zs. Kr.*, **34**, 206; in iron ore and graphite, Brazil; Derby, *Am. J. Sc.*, **13**, 211, 1902; character of monazite sand from Caucasus; Tschernik. [*Verh. russ. min. Ges.*, **41**, 43, 1903]; *Zs. Kr.*, **41**, 184; occurs in place at Blatherarm Creek, near Deepwater, N. S. W., analysis (1.63ThO<sub>2</sub>); Anderson, *Records Austr. Mus.*, **5**, 258, 1904; *Zs. Kr.*, **42**, 391.

**MONETITE**, *Min.*, p. 784. — Triclinic constants on artif. crystals:  $\alpha = 96^\circ 40'$ ;  $\beta = 88^\circ 44'$ ;  $\gamma = 103^\circ 48'$ ;  $a : b : c = 1.049 : 1 : 1.044$ ; de Schulten, *Bull. Soc. Min.*, **24**, 323, 1901.

**MONTMORILLONITE**, *Min.*, p. 690. — Anal. of variety, stolpenite, from Gross-Tresny, Mähren; Kovár, [*Abh. böhm. Akad.*, No. **15**, 1, 1896]; *Zs. Kr.*, **31**, 524. Anal. of material resembling montmorillonite, from Exeter, N. S. W.; Anderson, *Rec. Aus. Mus.*, **5**, 67, 1903.

**Montroydite**. A. J. Moses, *Am. J. Sc.*, **16**, 259, 1903; Hillebrand and Schaller; *ibid.*, **24**, 269, 1907.

Orthorhombic. Axes  $\bar{a} : \bar{b} : \bar{c} = 0.63797 : 1 : 1.1931$  (Moses); 0.6375 : 1 : 1.1977 (Schaller).

Forms:  $a$  (100),  $b$  (010),  $m$  (110),  $d$  (101),  $s$  (112),  $o$  (111),  $x$  (331),  $w$  (311),  $r$  (211),  $t$  (212),  $e$  (132). Hillebrand and Schaller record 56 forms in all. In minute prismatic crystals, highly modified; also forming velvety crusts.

Brittle.  $H. = 1.5-2$ .  $G.$  undet. Luster adamantine to vitreous. Color orange-red; streak same but lighter. Transparent. Ax. pl.  $\parallel$  (100),  $Bx \perp$  (001)? (Schaller. *priv. contr.*).

Composition, mercuric oxide, HgO, determined on 0.05 gram; analysis gave:

Loss on heating (assumed to be O) 7.13, sublimate (Hg) 92.87 = 100. Volatilizes completely in the closed tube, yielding a sublimate of metallic mercury. Dissolves readily in cold nitric or hydrochloric acid.

Associated sparingly with eglestonite and terlinguaite at the mercury deposits at Terlingua, Texas.

Named after Mr. Montroyd Sharpe, one of the owners of the Terlingua mines.

**Mooraboolite**. G. B. Pritchard, [*Victorian Naturalist*, **18**, 63, 1901]; *J. Ch. Soc.*, **82**, (2), 612, 1902; L. J. Spencer, *Min. Mag.*, **13**, 373, 1903. — A zeolitic mineral from the Moorabool valley, Victoria. As noted by Spencer the characters given agree closely with those of natrolite, to which it is doubtless to be referred.

**Moravite**. Franz Kretschmer, *Centralbl. Min.*, p. 293, 1906.

A chloritic mineral resembling thuringite. It occurs in lamellar, small-foliated to scaly and granular forms, with perfect basal cleavage.

$H. = 3.5$ .  $G. = 2.38$ . Luster greasy to pearly on the scales. Color iron-black. Streak dark smoky gray.

Composition,  $H_2Fe_2(Al,Fe)_4Si_4O_{24}$ .

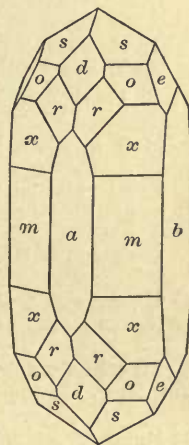
Analysis of carefully selected material:

SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	FeO	CaO	MgO	Na <sub>2</sub> O, K <sub>2</sub> O	H <sub>2</sub> O
49.30	22.71	5.04	13.99	tr.	1.82	1.10	4.95 graphite 0.55, P <sub>2</sub> O <sub>5</sub> tr. = 99.46

A second analysis on less pure, somewhat altered material is not quoted here.

B. B. fuses with difficulty to a black shining bead. Decomposed with hydrochloric acid with the separation of gelatinous silica.

Occurs abundantly at the iron-ore mines of Gobitschau near Sternberg, Moravia, Thuringite is present, also stilpnomelane and stilpnochloran (see also Kretschmer, *Centralbl. Min.*, 195, 1905).



Montroydite.

**Morencite.** *W. Lindgren and W. F. Hillebrand, Am. J. Sc., 18, 455, 1904.*

In brownish yellow fibrous seams with silky luster. Under the microscope appears as a nearly homogeneous felted aggregate; the fibers slightly pleochroic with parallel extinction and strong birefringence.

Composition uncertain. Analysis, W. F. Hillebrand:

SiO <sub>2</sub>	TiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	FeO	MnO	CaO	MgO	K <sub>2</sub> O	Na <sub>2</sub> O	H <sub>2</sub> O	X
45.74	tr.	1.98	29.68	0.83	tr.	1.61	3.99	0.20	0.10	13.92*	0.84† = 98.89

\* 8.84 at 105°, 0.12 at 150°, 4.27 below redness, 0.69 red heat. † FeS<sub>2</sub> 0.66, P<sub>2</sub>O<sub>5</sub> 0.18, CuO tr.

From Morenci, Arizona; found in a lime shale at the Arizona Central mine, 200 feet below the surface; probably derived from the oxidation of some contact metamorphic mineral.

MORINITE, Min., p. 1042.— Anal. of crystalline massive material from original locality yielded:

P <sub>2</sub> O <sub>5</sub>	F	Al <sub>2</sub> O <sub>3</sub>	Ca	Na <sub>2</sub> O	H <sub>2</sub> O
33.50	13.20	17.80	13.80	5.20	17.90 = 101.40 *

\* Anal. recalculated after deducting 1.50% SiO<sub>2</sub> and 0.20% H<sub>2</sub>O at 120°.

Formula derived may be written as 3AlPO<sub>4</sub>.HNa<sub>2</sub>PO<sub>4</sub>.3CaF<sub>2</sub>.8H<sub>2</sub>O or HNa<sub>2</sub>(AlF)<sub>3</sub>(CaF)<sub>3</sub>(PO<sub>4</sub>)<sub>4</sub>.8H<sub>2</sub>O.

Relation of composition to that of amblygonite, from which it has been derived, is discussed. Carnot and Lacroix, Bull. Soc. Min., 31, 149, 1908.

**Müllerite.** *F. Zambonini, Zs. Kr., 32, 157, 1899; 34, 225, 1901.*

Massive; resembling nontronite; in crusts, with rough surface.

Soft. G. = 1.97

Color yellowish green. Streak yellowish, dull. Opaque.

Composition, Fe<sub>2</sub>Si<sub>3</sub>O<sub>9</sub>.2H<sub>2</sub>O.

Analyses: 1, Zambonini; 2, Müller; 3, Uricocha (anal. 2 and 3 quoted; ref. not given).

	SiO <sub>2</sub>	Fe <sub>2</sub> O <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub>	MnO	MgO	H <sub>2</sub> O
1. Nontron	§ 48.82	35.88	4.30	0.63	0.35	9.66 = 99.64
2. Tirschenreuth	47.10	35.75	7.15	....	....	10.00 = 100.00
3. Tirschenreuth	47.59	42.49		....	0.13	9.79 = 100.00

B. B. infusible, loses water and finally becomes brown. Reacts for iron with borax. Slowly and imperfectly decomposed by concentrated hydrochloric acid.

From Nontron, Dordogne, France, and called "nontronite" (chloropal), but differs chiefly in lower percentage of water. Also stated to occur at Tirschenreuth, Bavaria. The mineral from Starbo, Sweden, analyzed by Weibull (Dana, Min., anal. 9, p. 701) is also near the above.

Named after Müller, who analyzed the Tirschenreuth mineral.

MURSINSKITE, Min., p. 1042.— Review of crystal measurements with conclusion that the specimens named as mursinskite were an iron-lime garnet; von Fedorow, Zs. Kr., 43, 36.

**Muschetowite.** *E. von Fedorow and W. Nikitin, [Ann. Géol. Min. Russ., 3, 87, 99, 1899]; Min. Mag., 12, 388.* A pseudomorph of magnetite after hematite. Urals.

MUSCOVITE, Min., p. 614; App., p. 48.— Crystals from Mitchell Co., N. C., show following new forms:  $\epsilon$  (447);  $h$  (556); (29.29.30);  $o$  (111);  $e$  (331);  $\tau$  (10.10.3);  $\theta$  (11.11.3);  $\eta$  (23.23.6);  $\nu$  (551). Baumhauer, Zs. Kr., 32, 164, 1899. In radial crystal groups; Johnsen, Centralbl. Min., 504, 1908.

Optical study of material from Monte Orfano, Italy; Viola, Zs. Kr., 32, 118, 1899. With unusual axial angle from the eclogite of the Fichtelgebirge; Johnsen, Centralbl. Min., 620, 1908.

Analysis of a pink fibrous variety, associated with lepidolite, from Haddam Neck, Conn.; Bowman, Min. Mag., 13, 98, 1902.

Fuchs site used as material for prehistoric implements in Guatemala; Bauer, Centralbl. Min., 291, 1900; as decorative stone by the ancients; Miers, Min. Mag., 13, 322.

From upper Veltlin, Italy; Linck, Jena, 33, 349, 1900.

**Naëgite.** *T. Wada, Minerals of Japan, 1904; Beitrage Min. Japan, 2, 23, 1906; Am. J. Sc., 19, 90, 1905.*

Probably tetragonal and isomorphous with zircon. Occurs in small spheroidal aggregates; rarely in pseudo-dodecahedral crystals. Color varies between dark pistachio-green, greenish gray and brown or reddish brown. Under microscope transparent, grass-green, highly

refractive, often nearly isotropic.  $H. = 7.5$ .  $G. = 4.09$ . Marked radioactivity. Analysis by Haga:

SiO <sub>2</sub>	ZrO <sub>2</sub>	UO <sub>3</sub>	ThO <sub>2</sub>	Nb <sub>2</sub> O <sub>5</sub> , Ta <sub>2</sub> O <sub>5</sub>	Y <sub>2</sub> O <sub>3</sub>
20.58	55.30	3.03	5.01	7.69	9.12 = 100.73

Earlier analyses by Tamura failed to find the zirconia.

Found with fergusonite in placer tin washings near Takayama, Mino province, Japan.

NAGYAGITE, Min., p. 105; App., p. 48. — Anal. and discussion of composition; Priwoznik, [Oesterreich. Zs. f. Berg-u. Hüttenwesen, 265, 1897]; Zs. Kr., 32, 185.

Narsarsukite. *G. Flink*, Medd. om Grönland, 14, 234, 1898; 24, 154, 1901.

Tetragonal. Axis  $c = 0.52352$ .

Forms:  $a$  (100),  $c$  (001),  $m$  (110),  $n$  (210),  $p$  (111).

Angles:  $(210) : (100) = 18^\circ 17'$ ;  $(111) : (110) = 53^\circ 29'$ .

In tabular crystals,  $c$  predominating; also rarely cubic. Faces  $c$  uneven, seldom bright;  $a$ ,  $m$ ,  $n$  bright and vertically striated.

Cleavage  $m$ , eminent. Fracture uneven. Brittle.  $H. = 7-7.25$ .  $G. = 2.751$ . Luster vitreous, on  $m$  pearly. Color honey-yellow, with tinge of reddish brown; on weathering passes to brownish gray or ochre-yellow. Transparent to translucent. Optically positive. Indices  $\omega_y = 1.5532$ ,  $\epsilon_y = 1.5842$ .

Composition, a highly acidic titano-silicate of ferric iron and sodium.

Analysis, Chr. Christensen:

SiO <sub>2</sub>	TiO <sub>2</sub>	Fe <sub>2</sub> O <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub>	MnO	MgO	Na <sub>2</sub> O	F	H <sub>2</sub> O
61.63	14.00	6.30	0.28	0.47	0.24	16.12	0.71	0.29 = 100.04 less O (0.30) = 99.74

B. B. fuses readily to a yellow blebby glass; reacts for titanium with salt of phosphorus. Not attacked by acids.

Occurs at several localities in pegmatite at Narsarsuk, southern Greenland; associated with ægirite, also microcline, albite, epidite, epididymite, tæniolite.

NASONITE, App., p. 48. — Described by Penfield and Warren, Am. J. Sc., 8, 346, 1899. In massive aggregates, crystallization probably tetragonal with imperfect basal and prismatic cleavage; birefringence rather strong, negative.  $H. = 4$ .  $G. = 5.425$ . The mean of two analyses by Warren gave:

SiO <sub>2</sub>	PbO	ZnO	MnO	FeO	CaO	Cl	(OH)
18.47	65.68	0.82	0.83	0.10	11.20	2.81	0.26 = 100.17 deduct 0.63 (O = Cl) = 99.54

The formula deduced is as before given,  $Pb_6Ca_4Cl_2Si_4O_{21}$ , or  $Pb_4(PbCl)_2Ca_4(Si_4O_7)_3$ . The authors show that nasonite is closely related to ganomalite, the formula of which should probably be written  $Pb_4(PbOH)_2Ca_4(Si_4O_7)_3$ .

Natroalunite. *W. F. Hillebrand* and *S. L. Penfield*, Am. J. Sc., 14, 220, 1902. — Name suggested for alunites containing considerable soda.

Natrochalcite. *C. Palache* and *C. H. Warren*, Am. J. Sc., 26, 345, 1908; Zs. Kr., 45, 534, 1908.

Monoclinic.  $a : b : c = 1.423 : 1 : 1.214$ ;  $\beta = 61^\circ 17' 30''$ . Habit pyramidal,  $m$  and  $p$  predominating, crystals 1 cm. long. Forms:  $c$  (001),  $b$  (010),  $m$  (110),  $p$  (111),  $v$  (112),  $u$  (221),  $w$  (331),  $q$  ( $\bar{1}11$ ),  $x$  (221). Cleavage perfect  $\parallel c$  (001).  $H. = 4.5$ .  $G. = 2.33$ . Color bright emerald-green. Refractive indices,  $\alpha = 1.6491$ ;  $\beta = 1.6555$ ;  $\gamma = 1.7143$ ;  $2V_{Na} = 36^\circ 52'$  (calc.). Ax. pl.  $\parallel b$  (010).  $B_{xac}$  inclined  $12^\circ$  to  $c$  axis in acute angle  $\beta$ . Optically +. Dispersion inclined, strong.

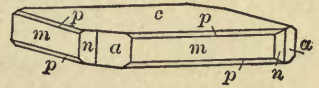
Comp.  $Na_2SO_4 \cdot Cu_4(OH)_2(SO_4)_2 + 2H_2O$ ; CuO, 42.08; Na<sub>2</sub>O, 8.24; SO<sub>3</sub>, 42.51; H<sub>2</sub>O, 7.17.

Anal. by Warren: CuO, 41.95; Na<sub>2</sub>O, 8.44; SO<sub>3</sub>, 42.10; H<sub>2</sub>O, 7.70; insol. res., 0.70; Cl (from atacamite), 0.05 = 100.94.

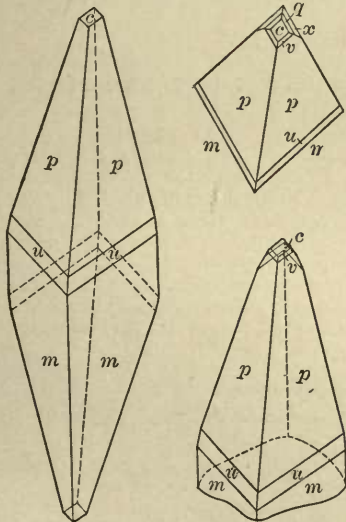
Occ. Found at Chuquicamata, Province of Antofagasta, Chile, associated with kröhnkite, blödite, brochantite, atacamite, etc.

Natrojarosite. *W. F. Hillebrand* and *S. L. Penfield*, Am. J. Sc., 14, 211, 1902. — See Jarosite.

NATROLITE, Min., pp. 600, 1042; App., p. 49. — Cryst. — Iceland; Jeremejew, [Bull. Acad. Sc. St. Pétersbourg, 9, 5, 1898]; Zs. Kr., 32, 428; Langesundfjord, Norway, with following



Narsarsukite.



Natrochalcite.

new forms: *g* (334); *k* (335); *j* (112); *p* (361);  $\epsilon$  (836);  $\xi$  (16.16.17); Zambonini, Zs. Kr., **34**, 549, 1901; from Leitmeritz, Gross-Priesen, with opt. study and anal.; Pelikan, Ber. Ak. Wien, **111**, (I), 343, 1902; Scottish localities; Goodchild [Trans. Geol. Soc. Glasgow, **12**, Suppl., 1-68, 1903]; Zs. Kr., **45**, 307; Narsarsuk, Greenland; Flink, Medd. om Grönl., **24**, 107, 1901; Kangerdluarsuk; Böggild, Min. Grönl., 531; Katzenbuckels, Odenwald, Baden; Freudenberg, [Mitt. bad. geol. Landesanstalt, **5**, 185, 1906]; Zs. Kr., **46**, 126, 1909.

**Anal.** — Moore Station, N. J.; Eyerman, Amer. Geol., **34**, 43, 1904; from nepheline-syenite, Montreal; Harrington, Trans. Roy. Soc. Canada, **11**, (3), 25, 1905; Monte Catini, Tuscany; Manasse, Proc. Soc. Tosc., Jan., 1906; and with discussion of chem. constitution; Bascieri, *ibid.*, March, 1907; Inverell, N. S. W.; Anderson, Rec. Aus. Mus., **6**, 420, 1907. Discussion of chem. comp.; Zambonini, Mem. Acc. Sci. Napoli, **14**, 117, 1908.

Association of natrolite (anal.) with datolite at Pokolbin, N. S. W.; Anderson, Rec. Aus. Mus., **5**, 2, 1904.

Action of ammonium chloride upon; Clarke and Steiger, Am. J. Sc., **9**, 345, 1900.

Alteration; Cornu and Schuster, Min. Mitth., **26**, 321, 1907.

**Mooraboolite** (which see) from the Moorabool valley, Victoria, is to be referred to natrolite, (Spencer). It occurs in white, radiated aggregates in a decomposed basalt.  $H. = 6$ .  $G. = 2.17$ . The crystals are elongated orthorhombic prisms terminated by an obtuse pyramid; no cleavage observed. Analysis, E. O. Thiele:

SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	CaO	Na <sub>2</sub> O	K <sub>2</sub> O	H <sub>2</sub> O
48.02	28.68	0.42	11.24	3.00	9.80 = 101.16 *

\* Author gives incorrectly the summation as 101.68%.

Following new analysis of "*sloanite*," Min., p. 610, from Monte Catini proves it to be thomsonite.

H <sub>2</sub> O	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	CaO	Na <sub>2</sub> O
9.76	46.49	25.47	1.10	17.05 = 99.87;

Manasse, [Proc. Soc. Tosc. Sc. Nat., **15**, 20-37, 1906]; Zs. Kr., **64**, 658.

**Natronkalisimonyite**, see *Blödite*.

**Nemaphyllite**. *Friedrich Focke*, Min. petr. Mitth., **21**, 327, 1902. — A serpentine peculiar in containing 2 p. c. of soda; see *Serpentine*.

**Neotantalite**. *Pierre Termier*, Bull. Soc. Min., **25**, 34, 1902.

Isometric, in octahedrons (up to 1 mm.) resembling pyrochlore; dodecahedral faces also occur.

$H. = 5-6$ .  $G. = 5.193$ . Luster nearly adamantine.

Color clear yellow. Translucent. Isotropic. Refractive index 1.9.

Composition near that of tantalite.

Analysis by Pisani, after deducting small amounts of SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, etc., due to admixed mica, and SnO<sub>2</sub> due to cassiterite, as follows:

Ta <sub>2</sub> O <sub>5</sub>	Nb <sub>2</sub> O <sub>5</sub>	FeO	MnO	Alk.	H <sub>2</sub> O (1200°)
60.58	23.10	4.80	3.00	2.31	6.51 = 100.30.

A little of the iron may be due to enclosed scales of hematite. From the sands yielded by the washing of kaolin of the Colettes and Echassières, Dept. l'Allier, France; these sands carry cassiterite in considerable amount.

**NEPHELITE**, Min., pp. 423, 1042; App., p. 49. — **Comp.** — Morozewicz [Bull. de l'Académie des Sciences de Cracovie, p. 958, Oct., 1907] gives new analyses as follows: 2 from Mariupol, 1 from Mias, 2 from Vesuvius. From these and other reliable analyses the author derives two series of empirical formulæ for the mineral.

Normal Series.

- (1) K<sub>2</sub> Na<sub>8</sub> Al<sub>10</sub> Si<sub>11</sub>O<sub>42</sub>
- (2) K<sub>2</sub> Na<sub>9</sub> Al<sub>11</sub> Si<sub>12</sub>O<sub>46</sub>
- (3) K<sub>2</sub> Na<sub>10</sub> Al<sub>12</sub> Si<sub>13</sub>O<sub>50</sub>
- (4) K<sub>2</sub> Na<sub>11</sub> Al<sub>13</sub> Si<sub>14</sub>O<sub>54</sub>

Basic Series.

- (1) K<sub>4</sub> Na<sub>18</sub> Al<sub>22</sub> Si<sub>23</sub>O<sub>90</sub>

The normal series can be represented by the general formula K<sub>2</sub> Na<sub>n</sub> Al<sub>n+2</sub> Si<sub>n+3</sub> O<sub>4n+10</sub> and can be considered as various mixtures of K<sub>2</sub>Al<sub>2</sub>Si<sub>3</sub>O<sub>10</sub> and Na<sub>2</sub>Al<sub>2</sub>Si<sub>2</sub>O<sub>8</sub>. The one member of the basic series can be considered as a mixture of K<sub>4</sub>Al<sub>4</sub>Si<sub>5</sub>O<sub>18</sub> with Na<sub>2</sub>Al<sub>2</sub>Si<sub>2</sub>O<sub>8</sub>. Any Fe<sub>2</sub>O<sub>3</sub> is considered to be isomorphous with Al<sub>2</sub>O<sub>3</sub>, CaO with Na<sub>2</sub>O and MgO with K<sub>2</sub>O. The small amounts of H<sub>2</sub>O are considered secondary.

**Anal.** of material from nepheline syenite at Montreal; Harrington, Trans. Roy. Soc., Canada, **11**, (3), 25, 1905.

Effect of ammonium chloride upon; Clarke and Steiger, U. S. G. S., Bull. 207, 1902; Zs. Kr., 38, 696.

Occurrence in syenite near Brookville, N. J.; Ransome, Am. J. Sc., 8, 417, 1899; in Ontario; Coleman, Am. J. Sc., 14, 148, 1902.

NEPHRITE, see under *Amphibole*.

**Nepouite.** *E. Glasser*, C. R., 143, 1173, 1906; Bull. Soc. Min., 30, 17, 1907.

Crystals, microscopic plates with hexagonal outline. Cleavage (1) perfect parallel to principal plane of the plates and (2) at right angles to (1) and parallel to the plane of the optic axes; (3) a poor cleavage also perpendicular to the first and inclined at 60° to the second.  $H\ 2-2.5$ .  $G$ . 2.47-3.24, varying with the composition. Pearly luster on best cleavage face. Color from pale to deep green, varying with the per cent of NiO. Plates are slightly dichroic,  $\omega$  = yellow green,  $\epsilon$  = green. Optically negative. Plane of optic axes perpendicular to principle cleavage and parallel to second cleavage. Axial angle very small. Strength of birefringence about 0.037.  $\beta$  = about 1.62-1.63.

Composition,  $3(Ni, Mg)O \cdot 2SiO_2 \cdot 2H_2O$ .

Analyses of material from different localities, New Caledonia:

	SiO <sub>2</sub>	NiO	MgO	FeO	CaO	Al <sub>2</sub> O <sub>3</sub>	H <sub>2</sub> O	
1. Reis II Mine, Nepoui.	32.84	49.05	3.64	1.90	0.50	0.97	9.64 =	98.54
2. Union Mine, Canala.	34.52	42.75	7.23	2.05	tr.	1.21	10.20 =	98.96
2a Union Mine, Canala.*	33.03	46.11	6.47	2.20	tr.	1.39	19.61 =	99.81
3. Young-Australia Mine, Com-bou River.	35.05	39.99	11.80	1.22	0.58	1.13	10.05 =	99.82
4. Paragraphe Mine, Kua River.	40.07	18.21	29.84	0.25	0.53	0.72	11.98 =	101.60
5. Mea Mine, Kouaoua.	32.36	50.70	3.00	0.62	tr.	0.69	12.31 =	99.68

\* Analysis 2a is of material of heavier specific gravity separated from 2.

Pyr., etc. — In closed tube yields water and blackens. Slowly but completely soluble in HCl. Gives reactions for Ni.

Obs. — Occurs in connection with the nickel deposits of New Caledonia. Named from the locality, Nepoui, where it was first observed.

NEPTUNITE, App., p. 49. — Crystals from Narsarsuk, Greenland, described by Flink, Medd. om Grönl., 14, 232, 1898; 24, 120, 1902; Böggild, *ibid.*, 33, 119, 1906; Wallenström, Geol. För. Förh., 27, 149, 1905. The following new forms are recorded:  $x$  (311),  $f$  (101),  $i$  (112),  $r$  (221),  $p$  (311),  $q$  (712). Found also at Tutop Agdlerkofia; Böggild, Min. Grönl., 502. Prismatic crystals from San Benito County, Calif., showing  $a$ ,  $m$ ,  $p$ ,  $s$ ,  $o$  and new form  $g$  (211) (fig.). Plane of optic axes parallel to  $b$  (010), acute bisectrix  $c$  making angle of 20° with  $b$  axis in obtuse angle  $\beta$ .  $2V = 48^\circ$ , approx. Ford, Am. J. Sc., 27, 235, 1909; Zs. Kr. 46, 321, 1909. The neptunite from California was first thought to be a new species and was named *carlosite*; Louderback, Uni. Calif. Pub., 5, 9, 152, 1907.

Analyses by Bradley (Am. J. Sc., 28, July, 1909) on California material confirm the formula obtained for the Greenland mineral. Average of two analyses follows:

SiO <sub>2</sub>	TiO <sub>2</sub>	MnO	CaO	FeO	MgO	K <sub>2</sub> O	Na <sub>2</sub> O	
52.87	17.83	0.85	1.56	11.68	1.45	5.08	9.56 =	100.88

NEWBERYITE, Min., p. 830. — Occurrence in tusk of mammoth found in swamp on Quartz Creek, 20 miles south of Dawson City, Yukon territory; Hoffmann, Am. J. Sc., 11, 149, 1901; in bat guano from Australia, (anal.); MacIvor, Chem. News, 85, 181, 217, 1902.

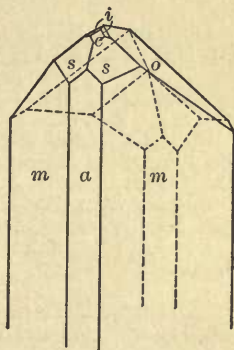
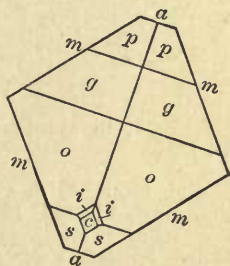
Artif. production; de Schulten, Bull. Min. Soc., 26, 24, 1903.

NICCOLITE, Min., p. 71. — Crystals from Mansfeld, Saxony; Sachs, Ber. Akad. Berlin, 856, 1902.

Occurrence at Cobalt, Canada; Miller, Rep. Bureau of Mines, Toronto, II, 1905.

NICKEL-IRON. Concerning possible existence of Fe<sub>2</sub>Ni<sub>3</sub> in meteoric iron of Younegin and meteoric stone of Zomba; Fletcher, Min. Mag., 15, 147, 1908. See *Awaruite*.

**Nignite.** *C. A. Peterson*, 20th Ann. Rep. U. S. G. S., 6, 257, 1899. A kind of asphaltum from Utah; also see under *Asphalt*.



Neptunite, California.

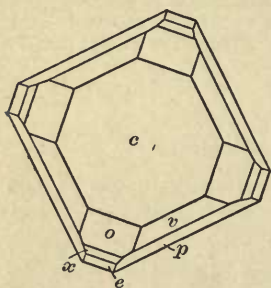
**NITER**, Min., p. 851; App., p. 49. — Crystals taken as hemimorphic and a new orientation proposed; Wernadsky, [Bull. Soc. Imp. Nat. Moscow, **2**, 292, 1897]; Zs. Kr., **31**, 518.

**NONTRONITE**, see *Chloropal*.

**NORTHROPITE**, App., p. 49. — Relations to tychite, which see. An isomorphous mixture of northropite and tychite obtained artificially by de Schulten, C. R., **143**, 403, 1906.

**NOSELITE**, Min., p. 432. — Variation in indices of refraction with variation in chem. comp.; Gaubert, Bull. Soc. Min., **28**, 188, 1905.

Anal. of material from Vicentino; Maddalena, Rend. Acc. Linc., **17**, (1), 802, 1908.



Brindletown, N. C.

348, 1903; in granite from Montorfano, northern Italy; Tacon, Rend. Acc. Linc., **14**, (2), 88, 1905.

**Oehrnite**. *E. S. Fedorov*, [Gornyi Zhurnal, St. Petersburg, **81**, 3, p. 264, 1905]; Spencer, Min. Mag., **14**, 405, 1907. A rock-forming mineral from the Caucasus resembling diallage in appearance; it has three rectangular cleavages but is shown by its optical characters to be monoclinic. Formula given as  $6(\text{Mg, Fe, Ca})\text{O} \cdot 6\text{SiO}_2 \cdot \text{H}_2\text{O}$ , but anal. shows also  $\text{Al}_2\text{O}_3$ , 6.74%. Named after A. G. Ern, a Russian mining engineer.

**OLDHAMITE**, Min., pp. 65, 1043. — Detected by anal. in Allegan meteorite; Tassin, Proc. U. S. Nat. Mus., **34**, 433, 1908.

**OLIGOCLASE**, Min., p., 322; App., p. 50. — Crystals from Biella, Italy, with anal.; Zambonini, Zs. Kr., **40**, 253; from Maneetsok, Greenland; Böggild, Min. Grönl., 465.

Optical study of oligoclase in granites of Sardinia; Riva, Att. Acc. Sc. Napoli, **12**, No. 9, 1905; refractive indices of crystals from inclusions in augite-andesite lava from Bellenberges near Mayen; Gaubert, Bull. Soc. Min., **28**, 196, 1905.

Material from near Lake Baikal known as lazurfeldspar has been proven to belong to oligoclase, (anal.); Jeremejew, Zs. Kr., **32**, 493; Bull. Soc. Min., **24**, 438, 1901.

Effect of ammonium chloride upon; Clarke and Steiger, U. S. G. S., Bull., **207**, 1902; Zs. Kr., **38**, 697.

**OLIVENITE**, Min., p. 784. — Crystals from Tintic Dist., Utah, showing new forms  $s$  (034),  $d$  (025); Farrington and Tillotson, Field Col. Mus., Geol. Series, **3**, No. 7, 152, 1908.

**OOLITE**. — Siliceous oolite from Tateyama, Etchū Province, Japan; Jimbō, Beiträge zur Min. von Japan, **1**, 11, 1905; Am. J. Sc., **19**, 399, 1905.

**OPAL**, Min., pp. 194, 1038; App., p. 50. — Study concerning the loss of water at various temperatures and periods of heating; D'Achiardi [Att. Soc. Tosc. Pisa, **11**, 114, 1899]; Zs. Kr., **34**, 305.

Microstructure; Bütschli, [Ver. Heidelb. Naturhist. Ver., **6**, 287, 1900]; Zs. Kr., **36**, 536.

Change to quartz; Spezia, Att. Acc. Sc. Torino, **37**, 585, 1902.

**OCTAHEDRITE**, Min., pp. 240, 1043; App., p. 50. — **Cryst.** — Piattagrande near Sondalo in Veltin, Italy; Brugnattelli, Zs. Kr., **32**, 355, 1900; Rend. R. Inst. Lomb., **32**, 1405, 1899; Scipius, St. Gotthard; Boeris, Att. Soc. Milano, **40**, 399, 1901; Riv. min. crist. ital., **28**, 75, 1902; complex crystals, Brindletown, N. C., (fig.); Robinson, Am. J. Sc., **12**, 180, 1901; Zs. Kr., **35**, 425; Prägratten, Tyrol; Pohl, Min. Mitth., **22**, 479, 1903; Binnenthal; Solly, Min. Mag., **14**, 16, 1904; Harre, Zs. Kr., **42**, 282, 1906; with following new forms:  $R$  (3.0.10);  $E$  (203) (?);  $H$  (332);  $T$  (11.2.12);  $L$  (25.11.5); Millosevich, Rend. Acc. Linc., **14**, 92, 1905; Somerville, Mass., showing interpenetration twins, (101) as tw. pl.; Palache, Festschr. siebzigsten Geburtstage, H. Rosenbusch, 311, 1906; Nil-Saint-Vincent, Brabant, with new form (449); Prinz, Bull. Ac. Belg., 706, 1907; Kollergraben, Binnen, with new form (338); Cesáro, *ibid.*, 336; Jequitinhonha River, Brazil, with new form M (338); Farrington and Tillotson, Field Col. Mus., Geol. Series, **3**, No. 7, 150, 1908.

Refractive indices; Taubert, [Inaug.-Diss., Jena, 1905]; Zs. Kr., **44**, 313.

Discussion of formula, see *Rutile*.

Occurrence in quartzite, Shankille, Co. Dublin, Ireland; O'Reilly, [Proc. Roy. Dublin Soc., **8**, 691, 1898]; Zs. Kr., **32**, 293; in the triassic sandstones, Midlands, England; Scrivenor, Min. Mag., **13**, 338; Farrington and Tillotson, Field Col. Mus., Geol. Series, **3**, No. 7, 150, 1908.



Gem opal from White Cliffs, Australia, found as filling openings in sandstone, in opalized fossil wood, in the material of various fossil shells and bones and in aggregates of radiating pseudomorphic crystals; Gürich, *Jb. Min., Beil.*, **14**, 472, 1901. Pseudomorphs, thought to be after glauberite; Anderson and Jevons, *Rec. Aus. Mus.*, **6**, 31, 1905.

ORANGITE, see under *Uraninite*.

ORPIMENT, *Min.*, pp. 35, 1043; *App.*, p. 50.—Stevanović, *Zs. Kr.*, **39**, 14, by etching and crystallographic study of crystals from Allchar, comes to the conclusion that the symmetry of orpiment is monoclinic. Following constants given:  $a : b : c = 0.5962 : 1 : 0.6650$ ;  $\beta = 90^\circ 41'$ . List of forms and angles given; also anal. Crystals from Mercur, Utah, with following rare forms,  $e$  (103) and  $K$  ( $\bar{1}23$ ), and the new forms  $d$  ( $\bar{1}03$ ),  $l$  (023) and  $n$  ( $\bar{1}33$ ); Farrington and Tillotson, *Field Col. Mus., Geol. Series*, **3**, No. 7, 154, 1908.

ORTHITE, *Min.*, p. 522.—Discussion of chem. comp.; Zambonini, *Mem. Acc. Sci. Napoli*, **14**, 76, 1908.

ORTHOCLASE, *Min.*, p. 315; *App.*, p. 50.—**Cryst.**—Monte Cimino near Viterbo, Italy, with anal.; Zambonini, [*Riv. Min., Padua*, **20**, 20, 1898]; *Zs. Kr.*, **32**, 533; of adular from Pisek, Bohemia; Krejci, *Ber. böhm. Ges. Wiss.*, xlv, 1899; measurement of crystals from various Italian localities with derivation of crystal constants; Zambonini, *Zs. Kr.*, **34**, 243, 1901; Elba with following new forms: (310); (740); (7.20.0); ( $\bar{1}3.0.12$ ); ( $\bar{1}6.0.13$ ); ( $\bar{5}06$ ); ( $\bar{1}4.0.15$ ); ( $\bar{1}2.0.1$ ); ( $\bar{7}37$ ); ( $\bar{1}1.1.10$ ); ( $\bar{5}.5.11$ ); ( $\bar{1}4.14.15$ ); (971); optical study also; Bartolini, [*Acc. Sc. Med. Nat. Ferrara*, 1901]; *Zs. Kr.*, **37**, 408; sanidine from Canale Monterano, Province Rome, Italy, with new form  $m$  (556); Zambonini, *Zs. Kr.*, **40**, 58, 1904; Igaliko, Greenland, with twinning on (201); Böggild, *Min. Grönl.*, 440. Crystallographic and optical study of orthoclase and microcline in granites of Sardinia; Riva, *Att. Acc. Sc. Napoli*, **12**, No. 9, 1905; study of development of crystals in simple and in twin forms; Neugebauer, *Min. Mitth.*, **25**, 413, 1906. Crystals from Corsica; Deprat, *C. R.*, **143**, 753, 1906; *Bull. Soc. Min.*, **31**, 271, 1908. **Twins**;—Shinano, Japan; Iwasaki, *Am. J. Sc.*, **8**, 157, 1899. On feldspar twinning; Viola, *Zs. Kr.*, **38**, 67, 1903; Carlsbad and Baveno twins; Sachs, *Min. Inst. Univ. Breslau*, 1903. Baveno twin from Striegau with (403); crystal from Isomraudnaiakop, Urals; Gonnard, *Bull. Soc. Min.*, **28**, 21, 1905; Baveno twins from Judith Mts., Montana (fig.); Ford and Tillotson, *Am. J. Sc.*, **26**, 149, 1908; *Zs. Kr.*, **46**, 129; twins from Four-la-Brouque, Puy-de-Dôme; Gonnard, *Bull. Min. Soc.*, **31**, 292, 1908; crystals (with anal.) from Valle del Chisone Piedmont; Colomba, *Att. Acc. Torino*, **43**, June, 1908.

Optical study of material from Calabria and Cimini, Italy; Viola, *Zs. Kr.*, **32**, 121, 124; of sanidine from Flegrea, Italy; Riva, *Rend. Acc. Linc.*, **9**, (2), 170, 1900.

Anal., from near Easton, Pa.; Eyerman, *Amer. Geol.*, **34**, 43, 1904; adular from Cavour, Piedmont; Colomba, *Att. Acc. Torino*, **39**, 829, 1904.

Effect of ammonium chloride upon; Clarke and Steiger, *U. S. G. S., Bull.*, **207**, 1902; *Zs. Kr.*, **38**, 697.

Occ. in New South Wales at Cockburn Creek (anal.), Oban, Uralla, Bolivia, Inverell; Anderson, *Rec. Aus. Mus.*, **64**, 265, 1907; in dolomite from Campolongo, Tessin; Linck, *Jb. Min.*, **1**, 21, 1907.

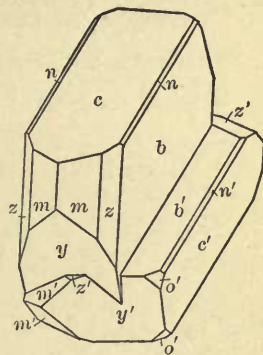
*Isorthose*. A var. of orthoclase differing in opt. orientation: the  $Bx_{ac} \perp (010)$ . Positive. Found in granite from northern Urals and at Mont Blanc. Duparc, *C. R.*, **138**, 715, 1904.

Osannite, var. of *amphibole*, which see.

Otavite. Otto Schneider, *Centralbl. Min.*, p. 388, 1906.

Forms crusts, showing on both surfaces minute rhombohedral crystals with terminal angle of  $80^\circ$  approx. Luster brilliant, adamantine. Color white to reddish. Dissolves with effervescence in hydrochloric acid. According to qualitative tests by Wölfer, a basic cadmium carbonate (Cd 61.5 p. c.). Found at the Tschumeb mine in the Otavi district, German Southwest Africa; azurite, malachite (dusted with greenockite), aurichalcite, cerussite, pyromorphite, linarite, olivenite, smithsonite occur at the same locality.

OZOCERITE, *Min.*, pp. 998, 999.—From Roumania; Istrati, [*Bull. Soc. Sc., Bucarest*, **6** 61, 1897]; *Zs. Kr.*, **32**, 187.



Judith Mts., Montana.

**Paigeite.** *A. Knopf and W. T. Schaller; Am. J. Sc., 25, 323, 1908.* A mineral originally described as being a hydrous borate of ferrous and ferric iron with magnesium. It has since been proven to contain a considerable amount of  $\text{SnO}_2$  and is probably identical with *hulsite*, which see. (Priv. contr. from W. T. Schaller.)

**Palacheite.** *A. S. Eakle, Bull. G. Univ. Cal., 3, 231, 1903.* — Described as a new ferric sulphate from the Redington mercury mine (Boston mine) at Knoxville, California, and named after Dr. Charles Palache of Harvard University; later shown by Eakle to be a variety of botrycon, which see.

PALLADIUM, Min., p. 28. — Occurrence in Brazil; Hussak, Ber. Akad. Wien, 113, 379, 1904.

**Palmerite.** *Eugenio Casorio, Att. Accad. Geogofili, 1, July 3, 1904.*

Amorphous, pulverulent. Color white and unctuous to the touch, resembling purified kaolin. In composition a hydrated phosphate of aluminium and potassium; calculated formula  $\text{HK}_2\text{Al}_2(\text{PO}_4)_3 + 7\text{H}_2\text{O}$ . Analysis:

$\text{P}_2\text{O}_5$	$\text{Al}_2\text{O}_3$	$\text{Fe}_2\text{O}_3$	$\text{K}_2\text{O}$	$\text{Na}_2\text{O}$	$\text{H}_2\text{O}(100^\circ)$	Ign.	$\text{SiO}_2$	$\text{NH}_3$
37.10	22.89	1.17	8.04	0.02	7.87	21.29	0.36	0.61 = 99.35

Insoluble in water but easily in hydrochloric and nitric acids.

Occurs as a stratum in a deposit of guano in a large cavern on the slopes of Monte Alburno, near Controne, in Salerno, Italy.

Named after Professor Paride Palmeri.

**Palmierite.** *A. Lacroix, Bull. Soc. Min., 30, 234, 1907; ibid., 31, 261, 1908.*

In microscopic micaceous plates, often hexagonal in outline.

G. greater than 3.33. Colorless with pearly luster. Uniaxial, optically—. Strong birefringence.

Composition uncertain, perhaps  $3(\text{K},\text{Na})_2\text{SO}_4 \cdot 4\text{PbSO}_4 = \text{SO}_3, 33.0; \text{PbO}, 52.3; \text{K}_2\text{O}, 11.1; \text{Na}_2\text{O}, 3.6$  (considering Na: K = 1:2).

Analysis on small amount of material after subtracting 22.59% impurities, mostly hematite, and 2.64% NaCl. Analyst, Pisani.

$\text{SO}_3$	$\text{PbO}$	$\text{K}_2\text{O}$	$\text{Na}_2\text{O}$
29.4	54.8	12.3	3.5 = 100.0

Pyr., etc. Decomposed by boiling water, leaving an insoluble residue of  $\text{PbSO}_4$ . Easily fusible. Dissolves in  $\text{HNO}_3$ .

Artificial. Was prepared synthetically by fusing together the different sulphates, giving crystal plates larger but identical in their properties with the naturally occurring mineral.

Obs. Found in the fumarole deposits at Vesuvius formed at the eruption of April, 1906. Closely associated with apthitalite.

Named in honor of the Neapolitan mineralogist, L. Palmieri.

PANDERMITE, see *Colemanite*.

**Paracelsian.** *E. Tacconi, Rend. Ist. Lomb., Milano, 38, 636, 1905; Zs. Kr., 43, 424.*

In grains. Yellow color. G. = 3.325. H. = 6. Biaxial, optically +. Birefringence somewhat lower than quartz.  $2V = 83^\circ 39'$  (approx.).

Comp. A barium aluminium silicate. Anal., corresponds to formula,  $\text{Ba}_3\text{Al}_3\text{Si}_3\text{O}_{31}$ . Analysis:

	$\text{SiO}_2$	$\text{Al}_2\text{O}_3$	$\text{BaO}$	Ign.
$\frac{2}{2}$	35.37	29.97	34.47	0.45 = 100.26

Pyr. Infus. Decomposed by warm acids.

Occ. Found with quartz and pyroxene in calciphyr at Candoglia, Toce valley, Piedmont. Probably to be considered a variety of celsian.

PARAGONITE, Min., p. 623. — From St. Gotthard with unusual axial angle; Johnsen, Centralbl. Min., 618, 1908.

**Parahopeite.** *L. J. Spencer, Min. Mag., 15, 18, 1908.*

Triclinic. Crystals deeply striated, bunched with subparallel grouping. Faces present are vertical prisms and pinacoids, base, and traces of domes or pyramids. Tabular  $\parallel a$ . Good cleavage  $\parallel b$ . Cleavage planes show parallel banding similar to that of basal cleavage with albite twinning. H. = 3.7. G. = 3.31. Colorless and transparent. On large plane a crystals show bright polarization colors; on  $b$  birefringence much lower. Angle of extinction on  $a = 30^\circ$  to edge  $ab$ . Extinction angle on cleavage,  $b$ , inclined but varying from  $0^\circ$  to  $25^\circ$  in respect to edge  $ab$ . Does not lose water and become opaque until heated to  $163^\circ$ .

Comp. same as for hopeite  $Zn_3P_2O_8 \cdot 4H_2O$ . Analysis:

ZnO	P <sub>2</sub> O <sub>5</sub>	H <sub>2</sub> O
53.0	31.6	15.6 = 100.2

Found at Broken Hill mines, N. W. Rhodesia.

PARALAURIONITE, App., p. 50. — *G. F. Herbert Smith*, *Min. Mag.*, **12**, 108, April, 1899; *ibid.*, **183**; *Zs. Kr.*, **32**, 217. *Rafaelite*. *A. Arzruni*, *Zs. Kr.*, **31**, 229; May, 1899.

Monoclinic, usually pseudo-orthorhombic on account of twinning.  $a : b : c = 2.7036 : 1 : 1.8019$  (*Min. Mag.*, **12**, 183, footnote).  $\beta = 62^\circ 47'$ .

Forms:  $a$  (100),  $c$  (001),  $d$  (10 $\bar{1}$ ),  $h$  (20 $\bar{1}$ ),  $k$  (40 $\bar{1}$ ),  $l$  (60 $\bar{1}$ ),  $p$  {111},  $m$  (110) and on rafaelite also (103), (101), (201), (010), (432). The form (111) of paralaurionite was taken as (132) in orig. description of rafaelite.

Angles:  $a \wedge m = *67^\circ 25'$ ;  $a \wedge p = *58^\circ 28'$ ;  $a \wedge c = *62^\circ 47'$ ;  $c \wedge m = 79^\circ 53'$ .

Crystals of two types, (1) tabular  $\parallel a$ ; (2) prismatic  $\parallel$  to edge  $ac$ . Twin. pl.  $a$ . Refractive index for ray  $\perp$  to  $b$  for sodium light = 2.1463.  $G. = 6.05$ . Color for paralaurionite white; rafaelite, violet red and shows strong pleochroism.

Comp. like laurionite;  $PbClOH$ .

Anal. by Prior; Pb, 78.1; Cl, 14.9; H<sub>2</sub>O, 3.4; O, [3.6] = 100.

Paralaurionite was found at Laurium; rafaelite from Chile. The close similarity of the recorded crystal angles proves the two to be identical. No analysis of rafaelite was made.

Crystals from Laurium, Greece; Lacroix and de Schulten, *Bull. Soc. Min.*, **31**, 82, 1908.

**Paratacamite.** *G. F. Herbert Smith*, *Nature*, **71**, 594, 1905; *Min. Mag.*, **14**, 170, 1906; *Zs. Kr.*, **43**, 28, 1906.

Rhombohedral. Axis  $c = 1.0248$ . Forms:  $a$  (11 $\bar{2}0$ ),  $c$  (0001),  $r$  (10 $\bar{1}1$ ),  $w$  (02 $\bar{2}5$ ),  $v$  (0.7.7.13),  $e$  (0112),  $u$  (0447),  $f$  (0221),  $l$  (2461).

Commonly in rhombohedral crystals ( $r$ ), crystals often twinned with  $r$  as tw. pl.; sometimes in slender prisms elongated parallel to the zone  $rfa$ .

Cleavage,  $r$  good. Fracture conchoidal. Brittle.  $H. = 3$ .  $G. = 3.74$ . Luster vitreous. Color bright green. Streak green. Refractive index 1.846. Shows optical anomalies.

Composition like atacamite,  $CuCl_2 \cdot 3Cu(OH)_2$ .

Analysis by Prior gave: Cl, 15.97; Cu, 14.27; CuO, 56.10; H<sub>2</sub>O, 14.10 = 100.44.

From the Herminia and Generosa mines, Sierra Gorda, Chile; also with native gold from the Bolaco mine, San Cristobal, Chile.

**Paravivianite.** *S. Popoff*, *Centralbl. Min.*, p. 112, 1906. — See *Vivianite*.

**Parianite.** *S. F. Peckham*, *Jour. Franklin Inst.*, **140**, 381, 1895. — Asphaltum from the Pitch Lake, Trinidad.

PARISITE, *Min.*, p. 290; App., p. 50. — The observations of Penfield and Warren given in App. I are published in *Am. J. Sc.*, **8**, 21, 1899.

Discussion of crystal constants; Cesàro, *Bull. Ac. Belg.*, 321, 1907.

In granite at Montorfano, northern Italy; Tacconi, *Rend. Acc. Linc.*, **14**, 2, 88, 1905.

**Patronite.** *Foster Hewett*, *Eng. Min. Jour.*, Sept. 1, 1906, p. 385; *J. J. Bravo*, [Informaciones y Memorias, Soc. Eng., Lima, Peru, **8**, 171, 1906]; *W. F. Hillebrand*, *Am. J. Sc.*, **24**, 148, 1907.

Amorphous, black material of complex mineral composition containing large amounts of a vanadium sulphide, perhaps VS<sub>2</sub>. Analyses of material extracted by alkalis from the ore gave V 19.16, 18.89, 19.09, 18.46; S 47.74, 47.84, 45.65, 44.74.

The material occurs in a complex mixture of mineral substances among which quisquite and bravoite were found, at Minasragra, Peru. Named after Antenor Rizo-Patrona, the discoverer of the ore.

PECTOLITE, *Min.*, p. 373; App., p. 51. — Crystals from Bergen Hill, N. J., show the new forms  $y$  (1.0.25),  $x$  (102),  $h$  (540); Moses, *Am. J. Sc.*, **12**, 99, 1901; from Scottish localities; Goodchild, [*Trans. Geol. Soc. Glasgow*, **12**, Suppl., 1-68, 1903]; *Zs. Kr.*, **45**, 305; Niakornat, Greenland, with new forms (201) and (104) with anal. by Christensen; Bøggild, *Min. Grönl.*, 388.

Composition discussed, Clarke and Steiger, *Am. J. Sc.*, **8**, 245, 1899, **9**, 349, 1900. Anal. from Graignefoch, near Johnstone, Renfrewshire; Houston, [*Trans. Geol. Soc. of Glasgow*, **12**, 354-361, 1906]; *Zs. Kr.*, **45**, 304. Magnesium pectolite with 5.54% MgO from diabase, at Burg near Herborn, Prussia; Renning, *Centralbl. Min.*, 739, 1907.

Occurs near Fort Point, San Francisco, in serpentine with datolite, etc., (analysis by Schaller); Eakle, *Bull. G. Univ. Cal.*, **2**, 315, 1901.

PELAGOSITE, *Min.*, p. 1044. — Anal. of material from Capparara, Tremiti Island; Squinabol and Ongaro, *Riv. Min. Crist.*, **26**, 44, 1900.

- PENINNITE, Min., p. 650; App., p. 51. — Optical study; Klein, Ber. Ak. Berlin, 114, 1902.
- PENFIELDITE, App., p. 51. — From Laurium, Greece; Lacroix and de Schulten, Bull. Soc. Min., 31, 83, 1908.
- PENTLANDITE, Min., p. 65; App., p. 52. — Occurrence at Evje, Norway; Stören, [Berg- u. hütten Zeitung, 63, 504, 1904]; Zs. Kr., 42, 633.
- PEROVSKITE, Min. p. 722; App. p. 52. — Study of the structure of perovskite from Burgumer Alp, Pfitschthal, Tyrol, by Bowman, Min. Mag., 15, 156, 1908, confirms results of Baumhauer, that mineral is probably orthorhombic, pseudo isometric.  
Crystals from Emsersee, Aosta with new form (950) and anal.; Millosevich, Rend. Acc. Linc., 10, (1), 209, 1901.  
Occurrence with anal. from S. Ambrogio, Susa, Piedmont; Boeris, Rend. Acc. Linc., 9, (1), 52, 1900; at Monte Lunella, Piedmont; Boeris, Att. Soc. Milano, 45, 306, 1906.
- Petterdite. W. H. Twelvetrees, separate publ., 1902; [Rep. Secy. Mines, Tasmania, 1900, 1; 1901, 356]; [Proc. Roy. Soc. Tasmania, 1900-1901, 51]; Zs. Kr., 42, 392; C. Anderson, Rec. Aus. Mus., 6, 137, 1906; Zs. Kr., 45, 313.  
Originally described as a new oxychloride of lead from Britannia mine, Zeehan, Tasmania, but proven by Anderson to be identical with *mimetite*.
- PETZITE, Min., p. 48; App., p. 52. — Anal. of material from Norwegian mine, Mother Lode Dist., Calif.; Hillebrand, Am. J. Sc., 8, 297, 1899.  
Occurs with other tellurides at Kalgoorlie in the East Coolgardie gold district in West Australia, cf. Spencer, Min. Mag., 13, 272, 1903; also Carnot, Bull. Soc. Min., 24, 361, 1901 (anal.), and Krusch, Centralbl. Min., 199, 1901.
- PHARMACOLITE, Min., p. 827; App., p. 52. — Occurrence at Schladming, Styria; Cornu, Centralbl. Min., 279, 1908.  
Artif.; de Schulten, Bull. Soc. Min., 26, 18, 1903.
- PHARMACOSIDERITE, Min., p. 847. — Refractive index; Gaubert, Bull. Soc. Min., 30, 108, 1907.  
Analyses of material from Cornwall showed the presence of  $K_2O$  in varying small amount. One analysis gave:
- | As <sub>2</sub> O <sub>5</sub> | P <sub>2</sub> O <sub>5</sub> | Fe <sub>2</sub> O <sub>3</sub> | K <sub>2</sub> O | H <sub>2</sub> O |
|--------------------------------|-------------------------------|--------------------------------|------------------|------------------|
| 37.16                          | 1.20                          | 37.58                          | 4.54             | 18.85 = 99.33    |
- Author suggests following formula:  $2FeAsO_4 \cdot FeO(H,K)_3 \cdot 5H_2O$ . Curious fact noted that a green crystal immersed in ammonia becomes red but recovers its original color on subsequent immersion in hydrochloric acid. Hartley, Min. Mag., 12, 152.
- PHENACITE, Min., p. 462; App., p. 52. — Crystal from German East Africa with new form (6515); Spencer, Min. Mag., 14, 178, 1906; from tin veins at Ehrenfriedersdorf, Saxony; Kolbeck and Henglein, Centralbl. Min., 365, 1908; also from Döbschütz near Reichenbach, and from Tschirnitz near Jauer in Silesia; *ibid.*, 547; from North Chatham, N. H.; Farrington and Tillotson, Field Mus., Geol. Series, 3, No. 7, 157, 1908.  
Anal. from Ober-Neusattel, Bohemia; Preis, [Ber. böhm. Ges. Wiss., 19, 1897]; Zs. Kr., 31, 526.  
Analyses; Aars, [Inaug.-Diss., Freiburg i. Br. 1905]; Centralbl. Min., 247, 1907.  
Result from alteration of danalite, Gloucester, Mass.; Palache, Am. J. Sc., 24, 252, 1907; Zs. Kr., 44, 17.
- PHILLIPSITE, Min., p. 579; App., p. 53. — Crystals from Hareö, Greenland; Böggild, Min. Grönl., 570.  
Analyses of various occurrences in the neighborhood of Rome lead to formula,  $R^{II}Al_2Si_3O_{10} \cdot 4H_2O$ ; Zambonini, Jb. Min., 2, 65, 1902. Discussion of chem. comp.; Zambonini, Mem. Acc. Sci. Napoli, 14, 114, 1908; anal. of material from Mont Simiouse, Loire, with discussion of chem. comp.; Gonnard, Bull. Soc. Min., 31, 269, 1908.  
A zeolite from the leucitite at Casal Brunori and Mostacciano near Rome having composition and general characters similar to phillipsite but differing in the manner in which it loses water on heating, has been named *pseudophillipsite* by Zambonini; Jb. Min., 2, 73, 1902; Bull. Soc. Min., 25, 360, 1902. Occurs in pseudo octahedrons, being made up of eight individuals. Analyses given lead to formula  $R^{II}_2Al_2Si_3O_{18} \cdot 9H_2O$ .
- PHLOGOPITE, Min., p. 632. — A crystal found at Sydenham, Frontenac Co., Ontario, had a length of more than 5 meters and a cleavage surface  $1.5 \times 2$  meters. W. H. McNairn, Am. J. Sc., 12, 398, 1901.  
Anal. of material in eruptive rock, "*wyomingite*," from the Leucite Hills and Pilot Butte, Wyoming; Hillebrand (in article by Cross), Am. J. Sc., 4, 130, 1897.

*Hydrophlogopite*. Anal. of material from Ceylon; Grünling, Zs. Kr., **33**, 218.

PHOSGENITE, Min., p. 292; App., p. 53. — Crystals from Sardinia; Cesàro, Bull., Ac. Belg., 328, 1907.

Fluorescence; Schincaglia, [Il Nuovo Cimento, Pisa, **10**, 212, 1899]; Zs. Kr., **34**, 312. Luminescence; Pochettino, Rend. Acc. Linc., **14**, (1), 505, (2), 220, 1905. Determination of refractive indices on crystal from Laurium, Greece, gave:  $\omega = 2.1181$ ;  $\epsilon = 2.1446$ ; Smith, Min. Mag., **12**, 107.

Specific gravity of material from Sardinia stated by Lovisato (priv. contr.) to range from 6.0 to 6.23.

Occurrence at Terrible mine, Isle, Custer Co., Colo.; Warren, Am. J. Sc., **16**, 343.

PHOSPHORUS. Occurrence of free phosphorus in meteorite from Saline Township, Kansas; Farrington, Am. J. Sc., **15**, 71, 1903.

PICROMERITE, Min., p. 948; App., p. 53. — Crystals (with anal.) from Kalusz, East Galicia; Kocchlin, Min. Mitth., **21**, 356, 1902.

Formation discussed; van't Hoff and Meyerhoffer, Ber. Ak. Berlin, 678, 1903.

PIEDMONTITE, Min., p. 521; App., p. 53. — Crystals from St. Marcel described with the new forms  $m_x$  (102),  $l$  (107),  $l$  (201); measured angles agree more closely with epidote than those of Laspeyres; Zambonini, Zs. Kr., **37**, 15, 1902.

PIETRICIKITE. Given as the correct spelling for *zietrisikite*, Min., p. 999; Istrati, [Bull. Soc. Sci. Bucarest, **6**, 65, 93, 1897]; Min. Mag., **12**, 389.

**Pigeonite**, var. of *pyroxene*, which see.

PILOLITE, see *Lassallite*.

PINNOITE, Min., p. 884. — Formation discussed; van't Hoff and Bruni, Ber. Ak. Berlin, 805, 1902.

PISANITE, Min., p. 943. — Occurs abundantly as a secondary mineral at a pyrite mine near Leona Heights, Alameda Co., Cal. Crystals, prismatic in habit, show the new forms:  $a$  (100),  $h$  (210),  $f$  (320),  $l$  (120),  $v$  (101),  $r$  (111),  $E$  (335),  $D$  (221),  $\sigma$  (121). Analyses after deducting in (1) 14.85 insol., in (2) 11.80, in (3) 8.67:

	SO <sub>3</sub>	FeO	CuO	MgO	H <sub>2</sub> O
1.	28.21	12.31	15.73	....	45.14 = 101.39
2.	29.18	16.47	9.22	....	45.74 = 100.61
3.	29.25	5.46	17.95	2.82	45.21 = 100.69

In 1 and 2 one-seventh of the water goes off at a high temperature. Hence the formula  $RSO_3 \cdot H_2O + 6H_2O$ . In 3 the results were H<sub>2</sub>O 34.25 at 110°, 10.96 above 110°. Schaller, Bull. G. Univ. Cal., **3**, 199, 1903; Am. J. Sc., **24**, 158, 1907. The same author has analyzed massive pisanite from Gonzales, Monterey Co., Cal. A review of all the analyses of the species shows that there is no definite ratio between the Cu and Fe, Am. J. Sc., **17**, 193, 1904.

PISSOPHANITE, Min., p. 971. — Thought to be distinct species; Mann, [Inaug.-Diss., Leipzig, 1904]; Zs. Kr., **42**, 665.

PITCHBLENDE, see *Uraninite*.

PITTICITE, Min., p. 867. — Anal. of material from Gross-Tresny, Mähren; Kovář, [Abh. böhm. Akad., No. 15, 1, 1896]; Zs. Kr., **31**, 524.

PLAGIONITE, Min., p. 118; App., p. 54. — Discussion of the chemical and crystallographic relations existing between plagonite, heteromorphite and semseyite. New analyses of plagonite from Wolfsberg, Harz; heteromorphite, Arnsberg, Westphalia; semseyite from Wolfsberg, Harz. No simple formulas being derived it is suggested that the three minerals may be members of a morphotropic series, the vertical crystallographic axis increasing in length with increase in the percentage of lead. Spencer, Min. Mag., **12**, 55.

**Planchéite**. A. Lacroix, C. R., **146**, 722, 1908; Bull. Min. Soc., **31**, 250, 1908.

Fibrous, often mammillary. Blue color.  $G = 3.36$ . Shows extinction parallel to length of fibers. Ax. pl. || to same. Strength of birefringence about 0.04. Index of refraction a little greater than that of diopase. Comp., silicate of copper with water. Formula =  $15CuO, 12SiO_2, 5H_2O$  or  $H_2Cu_7(Cu.OH)_8(SiO_3)_{12}$ ; SiO<sub>2</sub>, 36.04; CuO, 59.46; H<sub>2</sub>O, 4.50.

Anal. by Pisani: SiO<sub>2</sub>, 37.16; CuO, 59.20; FeO, tr.; H<sub>2</sub>O, 4.50 = 100.86.

Differs in reactions from diopside in that it is only with difficulty attacked by acids and without gelatinization.

Occ. Found associated with diopside, etc., at Mindouli, French Congo. Named in honor of M. Planché, who furnished the material.

PLATINUM, Min., pp. 25, 1044; App., p. 54. — Structure of platinum from the Urals; Beck, Ber. Sächs. Ges., Leipzig, 59, 387, 1907.

Distribution and geological relations; Kemp, U. S. G. S., Bull., 193, 1902. Occurrence in Norwegian nickel ores; Vogt, Zs. prakt. Geol., 10, 258, 1902; from Sumatra; Hundeshagen, Chem. News, 90, 77, 1904; Oregon and California; Day and Richards, Min. Resources U. S., 1905; Am. J. Sc., 23, 319; Brazil; Hussak, Ber. Ak. Wien, 113, 379, 1904; Zs. prakt. Geol., 284, 1906; in U. S., Am. J. Sc., 19, 398, 1905.

PLUMBOGUMMITE, Min., p. 855. — Analyses of material from Roughten Gill mines, Cumberland, and of hitchcockite from Canton Mine, Georgia, prove the two to be closely identical. Plumbogummite from Huelgoat, Brittany, was proven to be a mixture. Hartley, Min. Mag., 12, 223, and Miers, *ibid.*, 239. Prior, *ibid.*, 249, discusses its composition and suggests that it belongs to a group of minerals headed by hamlinite, which see.

Anal. of "fava" from diamond sands in Diamantina, Brazil, which is near plumbogummite; Hussak, Min. Mitth., 25, 341, 1906.

Plumbojarosite. W. F. Hillebrand and S. L. Penfield, Am. J. Sc., 14, 213, 1902. — See *Jarosite*.

PLUMOSITE, see under *Jamesonite*.

PLUSINGLANZ, a name given by Breithaupt to a silver mineral from Freiberg which is proven to be *argyrodite*; Frenzel, Min. Mitth., 19, 244.

Podolite. W. Tschirwinsky, Centralbl. Min., 279, 1907.

Hexagonal. In microscopic prismatic crystals, showing *m* (10 $\bar{1}0$ ) and *c* (0001). Also in spherulites.

Birefringence  $\gamma - \alpha = 0.0075$ .  $\beta = 1.635$ . Shows optical anomalies. Basal section shows division into six sectors of different optical orientation, and a perpendicular section shows an hour-glass structure. Color yellow, transparent.  $G = 3.077$ .

Composition,  $3Ca_3(PO_4)_2 \cdot CaCO_3$ . Analysis 1 on small amount of crystalline material. Analysis 2 on a nodule of somewhat impure material.

	P <sub>2</sub> O <sub>5</sub>	CO <sub>2</sub>	CaO	Fe <sub>2</sub> O <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub>	K <sub>2</sub> O	Na <sub>2</sub> O	F	SiO <sub>2</sub>	Organic	
1.	39.04	3.90	51.15	3.04	.....	.....	.....	.....	.....	.....	= 97.13
2.	36.44	4.18	51.31	1.73	0.46	0.45	0.66	0.26	4.87	0.56	= 100.92 - 0.08 = 100.84

Occurs in cavities in the phosphorite nodules found near the Uschitza River in the province of Podolien in southern Russia. Named from the locality.

POLLUCITE, Min., pp. 343, 1044; App., p. 54. — Effect of ammonium chloride upon; Clarke and Steiger, U. S. G. S., Bull., 207, 1902; Zs. Kr., 38, 695.

POLYCRASE, see under *Uraninite* and *Euxenite*.

POLYHALITE, Min., p. 950. — Artif. formation; Basch, Ber. Akad. Berlin, 1084, 1900; also, van't Hoff with Farup, d'Ans, *ibid.*, 1000, 1903; 412, 1906.

POWELLITE, Min., p. 989; App., p. 55. — From Barringer Hill, Llano Co., Texas, and from Nye Co., Nevada, with analyses; Schaller, Am. J. Sc., 25, 71, 1908; Zs. Kr., 44, 9.

PREHNITE, Min., p. 530; App., p. 55. — Crystals from Monte Pian Real, Val di Susa, Piedmont; Zambonini, Rend. Acc. Linc., 10, (2), 48, 1901; from Scottish localities with following new forms: *g* (210), *x* (104), *e* (012), *f* (210); Goodchild, [Trans. Geol. Soc. Glasgow, 12, Suppl., 1-68, 1903]; Zs. Kr., 45, 305; Josvas copper mine, Greenland, with new forms (410) and (301); Bögild, Min. Grönl., 291.

Anal. of material from Radaul, Harz; Fromme, Min. Mitth., 22, 62, 1903; Moore Station, N. J.; Eyerman, Amer. Geol., 34, 44, 1904; Biella, Italy; Zambonini, Zs. Kr., 40, 262, 1904. Rôle of water in; Zambonini, Mem. Acc. Sci., Napoli, 14, 17, 1908. Action of ammonium chloride upon; Clarke and Steiger, Am. J. Sc., 9, 345, 1900.

Occurrence in metamorphic limestone, Bariges valley, Hautes-Pyrénées; Lacroix, C. R., 131, 69, 1900; at Cala Francese, island of Maddalena (anal.); Rimatori, Rend. Acc. Linc., 11, (1), 542, 1902; Fedelino, Lake Como; Repposi, Rend. Acc. Linc., 15, (1), 510, 1906.

**Priorite**, see *Blomstrandine*.

**PROCHLORITE**, Min., p. 653. — Anal. from near Easton Pa.; Eyerman, Amer. Geol., **34**, 43, 1904.

**PROUSTITE**, Min., p. 134. — Crystals from Sarrabus, Sardinia; D'Achiardi, Mem. Soc. Tosc., **17**, 1900; new forms; Lamplough, Min. Mag., **13**, 294.

Occurrence (with anal.) at California mine on Glacier Mt., Montezuma, Summit Co., Colo.; Van Horn, Am. J. Sc., **25**, 507, 1908.

**PSEUDOBOLITE**, see *Boleite*.

**PSEUDOGAYLUSSITE**, App., p. 55. — Typical crystals have been obtained from the Clyde at Cardross opposite Greenock; Trechmann, Zs. Kr., **35**, 283, 1901; description of these crystals with anal.; Macnair, [Proc. Roy. Phil. Soc. Glasgow, **35**, 250, 1904]; Zs. Kr., **43**, 616.

**PSEUDOLEUCITE**, see *Leucite*.

**Pseudomeionite**, see *Meionite*.

**Pseudomesolite**, see *Mesolite*.

**Pseudophillipsite**, see *Phillipsite*.

**Pseudowollastonite**. Obtained artificially by heating wollastonite above 1180°. Shows basal cleavage; optically positive; nearly uniaxial and probably monoclinic. Mean refractive index closely the same as with wollastonite; birefringence higher. *Allen and White with Wright*; Am. J. Sc., **21**, 89, 1906; *Day and Shepherd*, *ibid.*, **22**, 290, 1906.

**PSILOMELANE**, Min., p. 257. — Anal. of copper-bearing psilomelane from Huiquintipa, Province of Tarapacá, Chile, giving: MnO, 69.65; CuO, 6.02; CoO, 0.52; BaO, 0.41; Fe<sub>2</sub>O<sub>3</sub>, 1.96; Al<sub>2</sub>O<sub>3</sub>, 1.97; H<sub>2</sub>O, 5.21; O, 14.14; total = 99.88; Keller, Proc. Amer. Phil. Soc., **47**, 79, 1908.

**PTILOLITE**, Min., p. 572; App., p. 55. — Occurrence (with anal.) from San Piero in Campo, Elba; D'Achiardi, Att. Soc. Tosc. Sc. Nat., **22**, 150-165, 1906; from Theigarhorn, Iceland, with anal.; Lindström, Geol. För. Förh., **29**, 106, 1907.

A zeolite similar to ptilolite found in needles enclosed in calcite from Teplitz Bay, Crown-prince Rudolf Island. Anal.; Colomba Att. Acc. Torino, **37**, 553, 1902.

**PUCHERITE**, Min., p. 755. — Optical study of crystals from Schneeberg; Cesàro, Bull. Ac. Belg., 142, 1905.

**Purpurite**. *L. C. Graton and W. T. Schaller*, Am. J. Sc., **20**, 146, 1905; *Schaller*, *ibid.*, **24**, 152, 1907; Zs. Kr., **44**, 1, 1907.

Orthorhombic (?) In small irregular masses. Cleavages: *a* rather perfect; *b* less distinct; *ab* probably 90°. Fracture uneven. Rather brittle. H. = 4-4.5. G. = 3.40. Luster satin-like on fracture surfaces. Color deep red or reddish purple, sometimes with slight bronze-like iridescence; streak purple or deep rose. Transparent in very thin pieces only. Refractive index 1.60-1.65. Pleochroism distinct, || cleavage deep scarlet, ⊥ cleavage purple.

Composition, essentially a ferric-manganic phosphate, 2(Fe,Mn)PO<sub>4</sub> + H<sub>2</sub>O. Analyses, Schaller:

	P <sub>2</sub> O <sub>5</sub>	Mn <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	CaO	Na <sub>2</sub> O	Li <sub>2</sub> O	H <sub>2</sub> O	Insol.
I. North Carolina	‡47.30	‡29.25	15.89	1.48	0.84	<i>tr.</i>	5.26	0.52 = 100.54
II. South Dakota	43.45	12.08	38.36	1.37		<i>tr.</i>	4.82	0.19 = 100.27
III. Branchville, Ct.	[44.00]	23.00	27.00	....	....		6.00	.... = 100.00

B. B. fuses easily; gives off water readily in the closed tube and becomes yellowish brown. Soluble in hydrochloric acid; in nitric acid black oxide of manganese separates.

Occurs at the Faires tin mine at Kings Mountain, Gaston Co., N. C., probably derived from the alteration of lithiophilite, which is sparingly associated with it. Also identified in small quantities with triphylite in the lithium-bearing pegmatite dikes at Pala, San Diego Co., California. At both localities a black or brownish black mineral with pitchy luster is also associated with the purpurite, doubtless derived from its alteration.

Also found near Hill City, S. D., and identified on a specimen from Branchville, Ct.

Named from the latin *purpura*, in allusion to the color.

**Pycnochlorite.** *Pyknochlorit*, J. Fromme, Min. Petr. Mitth., **22**, 69, 1903.

A chloritic mineral forming with calcite and quartz a vein of a sort of brecciated rock in the gabbro quarry, "Barenstein II," at the Schmalenberg, Radautal in the Harz. It occurs in grayish green compact or microcrystalline forms. H. = 1-2. G. = 2.83. Luster dull.

Analysis gave:

SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	FeO	MnO	CaO	MgO	Alk	H <sub>2</sub> O
26.55	16.91	2.04	25.29	0.46	0.70	15.88	tr.	12.06 = 99.89

PYRARGYRITE, Min., p. 131; App., p. 56. — Crystals from Sarrabus, Sardinia; D'Achiardi, Mem. Soc. Tosc., **17**, 1900; from Andreasberg, Harz, with new twinning plane, *W* (0118). Klockmann, Zs. Kr., **32**, 579; Hiendelaencina, Spain; Maurit, Zs. Kr., **44**, 344.

Occurrence at Cobalt, Ontario; Miller, Rep. Can. Bureau of Mines, **1905**, **2**; Zs. Kr., **43**, 395.

PYRITE, Min., pp. 84, 1045; App., p. 56. — **Cryst.** — From parisis locality, Ravalli Co., Montana, with new form (541); Zimányi, Zs. Kr., **32**, 243, 1899; Muso, Colombia, with new form (11.3.3); Busz, Jb. Min., **2**, 139, 1901; Csetras, Hungary, (Γ (215) new) described by Goldschmidt and Philipp, Zs. Kr., **36**, 386, 1902; Monzoni with the new forms (754) (643) show unusual distortion; Melzer, Zs. Kr., **37**, 268, 1902; Leona Heights, Alameda Co., Cal.; Schaller, Bull. G. Univ. Cal., **3**, 193, 1903; Passobreve, Piedmont; Zambonini, Centralbl. Min., **122**, 1903; twins according to spinel law, from French Creek, Pa.; Nicol, Am. J. Sc., **17**, 93, 1904; Goldschmidt and Nicol, Jb. Min., **2**, 93, 1904; Kottlerbach in Comitatus Szepes, Hungary, with following new forms: *I* (21.1.0); *p* (17.1.0) *U* (15.1.0); *H* (14.1.0); *G* (12.1.0); *B* (810); *J* (11.2.0); *C* (16.3.0); *A* (11.3.0); *κ* (850); *Λ* (11.10.0); *a* (11.9.7); *e* (14.11.8); *b* (852); *g* (951); *h* (13.7.1); *r* (25.15.6); *ω* (7.11.22); Zimányi, Zs. Kr., **39**, 125, 1904; Porkura, Csetrásgebirge, Hungary, showing new forms: (533), (15.14.14), (11.10.0), (17.14.0), (12.5.0), (830), (18.9.2), (10.5.2), (24.15.10), (821), (631), (15.11.7), (11.8.5), (45.36.20), (11.7.5); Maurit, *ibid.*, 357; Fojnica, Bosnia, with new forms, *Α* (18.10.5); *Β* (654); *Β*<sub>1</sub> (456); Maurit, [Földt. Közl., **34**, 484 or 537, 1904]; Zs. Kr., **44**, 70; from marble of Carrara; D'Achiardi, Att. Soc. Tosc. Sc., Mem. **21**, 1905; Nadabula, Gömör, Hungary, with new form (711) ?; Zimányi, Földt. Közl., **35**, 546, 1905; Rondout, Ulster Co., N. Y.; Whitlock, N. Y. State Mus. Bull., **98**, 1905; Zs. Kr., **43**, 393; Ivigtut, Greenland; Böggild, Min. Greenland, **46**; Franklin, N. J.; Gilpin Co., Colo., and unknown locality in Colo.; Kraus and Scott, Zs. Kr., **44**, 144, 1907; Major's Creek, N. S. W.; Anderson, Rec. Aus. Mus., **7**, 1, 67, 1908.

Crystals described as coming respectively from Porkura, Kis-Almas and Csetras are all from same locality, namely on Zsalyin brook near Porkura and Kis-Almas in the Csetras mountains, Hungary; Goldschmidt, Zs. Kr., **38**, 498, 1903.

Quantitative determination in presence of marcasite, which see. Action of potassium chlorate upon; Spezia, Att. Acc. Torino, **43**, April, 1908.

PYROAURITE, Min., p. 256; App., p. 56. — Occurs at Långban, Sweden, in thin tabular crystals (*c*) with the rhombohedron, *g* (4011), *cg* = \*82° 33'; hence *c* = 1.6557 [author gives 81° 33', which his other angles show is a misprint for 82° 33']. Also thick tabular crystals with *r* (1011), *f* (0221), *cr* = 62° 23', *cf* = 75° 21'. Flink, Bull. Geol. Inst. Upsala, **5**, 81-93, 1900.

PYROCHLORE, Min., p. 726; App., p. 56. — From river Tschoroch, Province Batum, Russia, with anal. Tschernik, [Ann. Géol. Min. Russ., **5**, 196, 1902]; Zs. Kr., **39**, 624. Anal. of material from Sundsvale, Sweden; Tschernik, [Jour. phys. chim. Russe, **36**, 457, 712, 1904]; Zs. Kr., **43**, 78.

PYROCHROITE, Min., p. 253. — Crystals from Långban, Sweden, described by Flink are long prismatic to thin tabular (*c*, *a*) with the rhombohedral forms: *p* (1014), *q* (3034), *r* (1011), Bull. G. Inst. Upsala, **5**, 87, 89, 1901. Crystals from same locality with anal. and determination of refractive indices; Sjögren, Geol. För. Förh., **27**, 37, 1905.

PYROLUSITE, Min., pp. 243, 1045; App., p. 56. — Analyses of manganese ores from Sardinia; Rimatori, Rend. Acc. Linc., **10**, (2), 226, 1901; occ. at Narysov, Příbram; Hoffmann, Ber. böhm. Ges. Wiss., xviii, 1903.

PYROMORPHITE, Min., p. 770; App., p. 56. — Twins with twinning plane (2021), from Friedrichsgegen near Ems; Klein, Centralbl. Min., **748**, 1902. Crystals associated with diopside from Mindouli, French Congo; Lacroix, Bull. Soc. Min., **31**, 256, 1908.

Refractive indices with anal. of material from Braubach, Nassau; Bowman, Min. Mag., **13**, 324.

From Braidwood, near Little River, New South Wales, with anal.; Mingaye, Trans. Austr. Assoc. Sc., **1898**. Anal. from Broken Hill, N. S. W.; Mingaye, White and Greig, [Rec. Geol. Sur. N. S. W., **8**, 182, 1905]; Zs. Kr., **43**, 623.

Occurrence in gold veins on Serebrjanka river, Urals; Karpinsky [Verh. russ. min. Ges., **42**, Prot. **20**, 1905]; Zs. Kr., **43**, 70. Occurrence in small crystals from Broken Hill N. W. Rhodesia; Spencer, Min. Mag., **15**, 33, 1908.

Radioactive from near Issy-l'Évêque, Saône-et-Loire; Danne, C. R., **140**, 241, 1905.



PYROPHYLLITE, Min., p. 691; App., p. 56. — Analyses by Baskerville of material from North Carolina; Pratt, N. C. Geol. Sur. Econ. Papers, 3, 1900; Zs. Kr., 36, 81.

Blue mineral similar to pyrophyllite from quartz vein near Kljutschy between Troisk and Tscheljabinsk in Gouv. Orenburg, Russia, with anal.; Morozewicz [Verh. russ. min. Ges., 40, 43, 1903]; Zs. Kr., 39, 611; also in Min. Mitth., 22, 97, 1903.

Composition discussed; Clarke and Steiger, Am. J. Sc., 8, 247, 1899. Chem. constitution; McNeil, Jour. Amer. Chem. Soc., 28, 594, 1906.

PYROSALITE, Min., p. 465. — Description of crystals from Bjelke mine in Nordmark, Sweden; with new analysis. Discussion of old analyses and formula derived =  $RCl_2 \cdot 12RO \cdot 10SiO_2 + 8H_2O$ . Zambonini, Zs. Kr., 34, 554. Discussion of chem. comp.; Zambonini, Mem. Acc. Sci. Napoli, 14, 22, 1908.

PYROSTILPNERITE, Min., p. 135; App., p. 56. — Occurs at the Long Tunnel mine, Heazlewood, Tasmania; W. F. Petterd, Notes on Tasmanian Minerals, priv. publ.

PYROXENE, Min., pp. 352, 1045; App., p. 56. — **Cryst.** — *Augite* from Yoneyama, Province of Echigo, Japan, with new forms (103), (203). Anal.; Iwasaki, Zs. Kr., 32, 302, 1900; Latium, Italy, with new forms,  $\mathfrak{B}$  (161),  $F$  (361),  $G$  (3.12.1),  $C$  (111),  $\mathfrak{S}$  (621), with anal.; Zambonini, *ibid.*, 33, 39, 1900; *ibid.*, 34, 259, 1901. *Diopside* from Ala, with new forms  $\tau$  (231),  $\nu$  (343),  $\omega$  (14.1.1); Zambonini, *ibid.*, 239; Ducktown, Tenn.; Moses, Am. J. Sc., 12, 105, 1901; *augite* crystal from the Laacher See with  $U$  (431); Busz, Jb. Min., 2, 139, 1901. *Augite* twins from island of Stromboli; Barvir, Ber. böhm. Ges. Wiss., xlvii, 1902; *diopside* from Ala, Piedmont; Zambonini, Centralbl. Min., 124, 1903; *diopside* (with anal.) from Moravicz, Hungary; Weinschenk, Min. Mitth., 22, 363, 1903; *augite* from Canale Monterano, Province Rome, Italy, with new form  $\mathfrak{B}$  (605); anal.; Zambonini, Zs. Kr., 40, 52, 57, 1904; *diopside* from the coozon limestone, Côte St. Pierre, Canada, with anal.; Preiswerk, Zs. Kr., 40, 498, 1905; *diopside* from Maneetsok, Greenland; Böggild, Min. Grönl., 373; *augite* twins from Vesuvius; Cesàro, Bull. Ac. Belg., 329, 1907; crystals from Lyon Mt., Clinton Co., N. Y.; Whitlock, N. Y. State Mus. Bull., 107, 66, 1907.

**Opt.** — *Diopside* crystals with optical measurements from crystalline limestone at Altstadt, Mähren; Pelikan, Min. Mitth., 19, 106, 1900; anal. of same; Pelikan, *ibid.*, 338. Dispersion of optic axes in orthorhombic pyroxenes; Luczizky, Min. Mitth., 24, 140, 1905. Chemical and optical study of monoclinic pyroxenes with small angle between optic axes and low content of lime; Wahl, Min. Mitth., 26, 1-131, 1907. Optical constants of rock forming pyroxenes from various localities; Duparc and Pearce, Bull. Soc. Min., 31, 96, 1908.

**Anal.** — Anal. of material in eruptive rock "wyomingite," from the Leucite Hills and Pilot Butte, Wyoming; Hillebrand (in article by Cross), Am. J. Sc., 4, 130, 1897. Anal. of *coccolite* from Bistrau, Bohemia; Kovář, [Abh. böhm. Akad., 28, 1899]; Zs. Kr., 34, 705; of *augite* from Uifak, Godhavn District, Greenland; Nicolau, [Medd. om Grönl., 24, 228, 1901]; Min. Grönl., 377; of *diopside* from San Pablo, California; Blasdale, Univ. Calif. Bull., Dept. Geol., 2, 11, 327, 1901; of soda-rich pyroxene from Oropa, Piedmont; Zambonini, Rend. Acc. Linc., 10, (1), 240, 1901; of *augites* containing  $TiO_2$  and  $Al_2O_3$ , with discussion of composition; also optical study; Becker, [Inaug.-Diss., Erlangen, 1902], Centralbl. Min., 730, 1902; Zs. Kr., 38, 317. Chromium bearing *omphacite* with anal., from Lake Brocan, Valle del Gesso di Entraque, Piedmont; Roccati, [Boll. Soc. geol. ital., 24, 659, 1905]; Zs. Kr., 43, 499. Anal. of *augite* from Paschkopole near Boreslau, Bohemia, with discussion of chem. comp.; Hampel, Min. Mitth., 27, 270, 1908.

Occurrence of a monoclinic pyroxene in meteorite from Zavid, Bosnia; Berwerth, [Mitth. aus Bosnien u. d. Herzegovina, 8, 409, 1901]; Zs. Kr., 38, 320; of orthorhombic and monoclinic pyroxene in meteorite from Peramiho, Dutch East Africa; Berwerth, Ber. Acad. Wien, 112, (1), 739, 1903.

Concerning products of weathering of *augite*, *anauxite* and *cimolite* (with analyses); Smirnov, Zs. Kr., 43, 338, 1907. Alteration to amphibole; Duparc, Bull. Soc. Min., 31, 50, 1908.

Artif. formation of; Allen, Wright and Clement, Am. J. Sc., 22, 385, 1906; summarized in Science, Mar. 8, 1907, p. 389.

A zinc *schefferite* from the Parker shaft at Franklin Furnace, N. J., has been analyzed by Wolff, Proc. Amer. Acad., 36, 115, 1900. It occurs in large foliated masses, with very perfect basal cleavage.  $c \wedge c' = 40^\circ 35'$ .

	SiO <sub>2</sub>	Fe <sub>2</sub> O <sub>3</sub> , Al <sub>2</sub> O <sub>3</sub>	MnO	ZnO	MgO	CaO	Ign.	
G. = 3.31	52.86	1.08	5.31	3.38	13.24	24.48	0.45	= 100.80

The optical constants have been minutely determined by Melzer, *ibid.*, p. 116.

Occurrence of iron *schefferite* in Caucasus; Sioma, Zs. Kr., 34, 279.

*Fedorowite* has been further studied with the following additional determinations. Axial ratio:  $a : b : c = 1.0927 : 1 : 0.5489$ ;  $\beta = 106^\circ$ .  $\alpha = 1.680$ ,  $\beta = 1.687$ ,  $\gamma = 1.709$  for Na light.

Analysis:

	SiO <sub>2</sub>	Fe <sub>2</sub> O <sub>3</sub>	FeO	Al <sub>2</sub> O <sub>3</sub>	CaO	MgO	Na <sub>2</sub> O	Total
I.	52.35	2.24	1.94	2.38	24.63	14.40	2.54	100.48
II.	52.37	4.08		2.46	24.51	14.66	2.05	100.13

Viola and Kraus, Zs. Kr., 33, 36, 1900.

*Pigeonite*, name given by Winchell, *Am. Geol.*, **26**, 204, 368, 1900, to pyroxene with small and variable axial angle from Pigeon Point, Minn.

\* *Violaite*, name given to highly pleochroic pyroxene, occurring in igneous dike (kedabekite) associated with plagioclase and garnet near Kedebek copper mine in the Caucasus; v. Fedorow, [*Ann. l'Inst. agronomique Moscou*, **1**, 43, 1901]; *Zs. Kr.*, **37**, 414.

*Ægirine-hedenbergite*, name given to a pyroxene intermediate in composition between ægirite and hedenbergite; Wolff, *Centralbl. Min.*, **214**, 1902; Rosenbusch uses *Hedenbergit-Ægirin*, *Mikrosk. Phys. Min.*, **1**, part 2, 218, 1905.

*Blanfordite*. A monoclinic pyroxene containing some sodium, manganese and iron, occurring with manganese ores in the Central Provinces, India. Strongly pleochroic (rose-pink to sky-blue). Named after Dr. W. T. Blanford (1832-1905). Fermor, [*Trans. Min. Geol. Inst. India*, **1**, 78, 1906]; Spencer, *Min. Mag.*, **14**, 395, 1907.

PYRROHITE, *Min.*, p. 73; App., p. 57. — Crystals from Tollegno, Piedmont; Zambonini, *Centralbl. Min.*, **121**, 1903; from Bottino; D'Achiardi, [*Proc. Soc. Toscana Sc. Nat. Pisa*, **13**, 140, 1903]; *Zs. Kr.*, **41**, 262; from Igdlökunguak, Greenland; Böggild, *Min. Groenland*, 39.

Considered by study of magnetic properties, etching figures, etc., to be orthorhombic in symmetry, but pseudo-hexagonal through twinning; Kaiser, *Centralbl. Min.*, **261**, 1906; Weiss, *ibid.*, 338.

Magnetic properties of; Weiss, *C. R.*, **126**, 1099, 1898; [*Jour. de phys.*, **8**, 314, 1898]; *Zs. Kr.*, **34**, 631; [*Arc. Sc. phys. et nat.*, Genf, **16**, 473, 1903]; *Zs. Kr.*, **41**, 110; Kunz, [*Arc. Sc. phys. et nat.*, Genf, **18**, 260, 1904]; *Zs. Kr.*, **42**, 204; Weiss, [*Phy. Zs.*, **6**, 779, 1905]; [*Jour. phys.*, **4**, 469, 829, 1905]; *C. R.*, **140**, 1332, 1587, 1905; Weiss and Kunz, [*Jour. phys.*, **4**, 847, 1905]; *C. R.*, **141**, 182; *Zs. Kr.*, **43**, 518-522.

Occurrence at Burgk, Saxony; Bergt, *Ber. Abh. Naturwiss. Ges. Isis, Dresden*, **20**, 1903. From Sardinia; Serra, *Rend. Acc. Linc.*, **16**, (1), 347, 1907.

QUARTZ, *Min.*, pp. 183, 1046; App., p. 57. — Cryst. — From Opprebais, Belgium; Buttgenbach, *Ann. soc. géol. Belg.*, **25**, 111, 1898. Striegau, Silesia; Gonnard, *Bull. Soc. Min.*, **22**, 92, 1899; Quenast; van Hove, [*Mém. cour. et Mém. des Sav. étrangers, Acad. roy. de Belg.*, **58**, 1, 1900]; *Zs. Kr.*, **35**, 642; twin from Trarbach, Rhine province, Germany; Kaiser, *Centralbl. Min.*, **94**, 1900; crystals from Bourg d'Oisans, Dauphiné; Gonnard, *Zs. Kr.*, **34**, 279, 1901; twin from Annaberg in Saxony; Johnsen, *Centralbl. Min.*, **649**, 1902; twins from Mies, from Sárka valley near Prag; Barvř, *Ber. böhm. Ges. d. Wiss.*, **8**, 1902; *Zs. Kr.*, **39**, 398; crystals from Brazil; Gonnard, *Bull. Soc. Min.*, **25**, 56, 1902; *ibid.*, 59; Valais, Switzerland; *id.*, *ibid.*, 61; crystallographic notes; *id.*, *ibid.*, 90; twin from Japan; Friedel, *ibid.*, 110; crystals from De Aar, Cape Colony, S. Afr.; Barker, *Min. Mag.*, **13**, 331, 1903; Hancock, Mich., and Herkimer, N. Y., with several new forms and a "Winkeltabelle" for them; Lincio, *Jb. Min.*, Beil., **18**, 155, 1904; smoky quartz crystals from Mokruscha Mt., near Mursinka, Russia; Worobieff, [*Verh. russ. min. Ges.*, **42**, Prot. 52, 1905]; *Zs. Kr.*, **43**, 71; crystals from Guggiate, Lake Como; Repossi, *Att. Soc. Milano*, **44**, 106, 1905; East Greenland; Flink, *Medd. om Grönl.*, **24**, 17, 1901; Böggild, *Medd. om Grönl.*, **28**, 104, 1905; twinning; Goldschmidt, *Min. Mitth.*, **24**, 157 and 167, 1905; *Zs. Kr.*, **44**, 407; crystals from San Diego Co., Calif.; Waring, *Am. J. Sc.*, **20**, 125, 1905; Meylan, Isère, France; Gonnard, *Bull. Soc. Min.*, **22**, 94, 1899; *ibid.*, **29**, 303, 1906; Gletsch, Switzerland; Busz, *Centralbl. Min.*, **753**, 1906; Fedelino, Lake Como; Repossi, *Rend. Acc. Linc.*, **15**, (1), 506, 1906; Lyon Mt., Clinton Co., N. Y.; Whitlock, N. Y. State Mus., *Bull.*, **107**, 56, 1907; Brusson, D'Aosta; Colomba, *Att. Acc. Torino*, **42**, 904, 1907; Simplon tunnel; Cesàro, *Bull. Ac. Belg.*, **315**, 1907; Valle del Chisone, Piedmont; Colomba, *Att. Acc. Torino*, **43**, June, 1908.

Pseudomorph after apophyllite near Fort Point, San Francisco, Calif.; Schaller, *Am. J. Sc.*, **17**, 194, 1904.

Crystallographic symmetry of *tridymite*, *crystalite* and *quartz*; Beekenkamp, *Zs. Kr.*, **34**, 569.

Opt. — Dispersion of the infra-red rays in quartz; Carvallo, *C. R.*, **126**, 728, 1898; study of effect of compression upon double refraction; Dongier, [*Thèse fac. des sc. Paris*, 1898]; [*Ann. chim. phys.*, **14**, 448, 1898]; *C. R.*, **124**, 26, 1897; *Zs. Kr.*, **32**, 541. Optical study; D'Achiardi, *Att. Toscana, Pisa*, **17**, 114, 1899; Viola, *Zs. Kr.*, **32**, 551, 1900; optical constants for green mercury light; de Lépinay, [*Jour. d. phys.*, **9**, 644, 1900]; *Zs. Kr.*, **35**, 630. Form of wave surface of ordinary ray; de Lépinay, *Zs. Kr.*, **34**, 280, 1901; Viola, *ibid.*, 281. Rotatory power at temperature of liquid air; Levi, [*R. Ist. Veneto*, **60**, 559, 1901]; *Zs. Kr.*, **37**, 317. Rotation of polarization plane in magnetic field; Borel, [*Arc. Sc. phys. et nat.*, Genf, 1903, **16**, 24, 157]; *Zs. Kr.*, **41**, 108. Dichroism induced in quartz by radium; Ergoroff, *C. R.*, **140**, 1027, 1905; *Zs. Kr.*, **43**, 514. Pyroluminescence; V. M. Goldschmidt, [*Forh. i Videnskabs-Selskabet i Kristiania Aar*, No. 5, 1-15, 1906]; *Zs. Kr.*, **45**, 106.

Etching figures formed at high temperature; Friedel, *Bull. Soc. Min.*, **25**, 112, 1902. Natural and artificial etching figures and their relations to optical properties, pyroelectricity, etc.; Martini, *Jb. Min.*, **2**, 43, 1905.

Pyroelectricity; Beekenkamp, *Zs. Kr.*, **32**, 9, 1899. Dielectric constants; Fellingner [*Inaug.-Diss.*, München, 1899]; *Zs. Kr.*, **35**, 186. Electrical double refraction, etc.; Quesneville, *Zs. Kr.*, **33**, 102, 1900.

Elastic constants of amorphous quartz; Schulze, [*Ann. d. Phys.*, **14**, 384, 1904]; *Zs. Kr.*, **42**, 498. Cause of color, Königsberger; *Min. Mitth.*, **19**, 148; Nabl, *Ber. Acad. Wien*, **108**, 48, 1899.

Inclusion of organic sulphides in quartz from Salangen, Norway; Sjögren, Geol. För. Förh., 27, 113, 1905; liquid inclusions from Alpine localities; Königsberger and Müller, Centralbl. Min., 72, 1906.

Relationships between quartz, *chalcedony* and *opal*; Leitmeier, Centralbl. Min., 632, 1908. Fibrous silica and its relations to opal and quartz; Hein, Jb. Min., Beil., 25, 182, 1908.

Solubility in sodium silicate; in sodium tetraborate; Spezia, Att. Acc. Torino, 35, 750, 1900; *ibid.*, 36, 631, 1901; also experiments on the growth of quartz crystals, *ibid.*, 40, Jan., 1905; 41, Dec., 1905; 44, Nov., 1908.

Quartz and gelatinous silica in Simplon tunnel; Spezia, Att. Acc. Torino, 34, 705, 1899.

Siliceous oolite of Tateyama, Etchū Province, Japan; Jimbō, Bei. Min. Japan, 1, 11, 1905.

Artif. formation; Day and Shepherd, Am. J. Sc., 22, 275, 1906; Quensel, Centralbl. Min., 657, 1906; *ibid.*, 728. Synthesis of amethyst; Berthelot, C. R., 143, 417, 1906.

*Pseudochalcedon*, a chalcedony-like material, biaxial, optically negative, length of fibers  $\parallel a$ . Birefringence = 0.0045.  $G = 2.5$ . Chemically = water-free  $\text{SiO}_2$ . Lacroix, C. R., 130, 430, 1900; Zs. Kr., 35, 633.

Occurrence of chalcedony on shore of Black Sea, Caucasus; Karpinsky, [Verh. russ. min. Ges., 42, Prot. 29, 1905]; Zs. Kr., 43, 70.

Quartz glass. — Heraeus, Deutsche Mech. Ztg., Oct. 1, 1903; Am. J. Sc., 16, 469, 1903. Optical properties; Gifford and Shenstone; Proc. Roy. Soc., 73, 201; Am. J. Sc., 17, 399, 1904.

QUARTZINE, App., p. 58. — Occurrence at Mohelmo, Mähren; Barvř, [Ber. böhm. Ges. Wiss., 14, 1897]; Zs. Kr., 31, 525.

Quisqueite. W. F. Hillebrand, Am. J. Sc., 24, 142, 1907.

A black lustrous material, composed chiefly of C and S. Analysis gave: S (soluble in  $\text{CS}_2$ ), 15.44; S (combined), 31.17; C, 42.81; H, 0.91; N, 0.47; O (by difference), 5.39;  $\text{H}_2\text{O}$  (at  $105^\circ$ ), 3.01; Ash, 0.80; total 100.00. Ash analyzed gave:  $\text{SiO}_2$ , 0.04;  $\text{Al}_2\text{O}_3$ , 0.08;  $\text{Fe}_2\text{O}_3$ , 0.10; NiO, 0.06;  $\text{V}_2\text{O}_5$ , 0.52. Occurs in a vein adjoining the vanadium ore known as *patronite*, at Minasragra, Peru. Named from a settlement near place of occurrence.

RADIOACTIVE MINERALS. — Study of the radioactivity and percentages of  $\text{U}_3\text{O}_8$ ,  $\text{ThO}_2$  and He in the following: uraninite, torbernite, thorianite, æschynite, samarskite, gadolinite, cyrtolite, sipylite, euxenite, carnotite, pyromorphite, microlite, orangite, monazite, thorite, alvite, xenotime, amerôdite, fergusonite, malacon, allanite, yttrorantalite, polycrase, zircon; Strutt, Proc. Roy. Soc., 76, 88, 312, 1905; Chem. News, 91, 299, 1905; radioactivity of uranium minerals, Boltwood, Am. J. Sc., 25, 269, 1908.

Radiotite. R. Brauns, Jb. Min., Beil.-Bd., 18, 314, 1904.

Fibrous, radiating. In very small spherical aggregates.

G. 2.70. Color yellow. Double refraction medium.  $a$  parallel to length of fibers.

Composition. —  $\text{H}_2\text{Mg}_2\text{Si}_2\text{O}_9$  like serpentine.

Analyses by F. W. Küster, of material from Dillenburg:

	$\text{SiO}_2$	MgO	$\text{Fe}_2\text{O}_3$	CaO	$\text{H}_2\text{O}$
1.	41.48	35.84	8.40	1.50	11.96 = 99.48
2.	41.50	35.73	8.50	0.55	12.13 = 98.41

Pyr. etc. Yields much water in closed tube, mineral becoming brown. Insoluble in HCl. Treated with HF gives magnesium fluor-silicate, which is soluble in water, and solution gives strong reaction for magnesium and weaker reactions for iron and calcium.

Dif. Distinguished from serpentine by its insolubility in HCl and its higher specific gravity.

Occurs intimately intergrown with serpentine, from which it has been derived, in an altered *perite* near Dillenburg, Nassau. Also observed with serpentine at Steimperf, Rachelshausen, etc. Named on account of its radial structure.

Rafaelite, see *Paralaurionite*.

RAMOSITE, Min., p. 562. — Proven to be not a definite mineral but a basic volcanic scoria; Luquer, Am. J. Sc., 17, 93, 1904.

RASPITE, App., p. 58. — Crystals from gold sands at Sumidouro, Minas Geraës, Brazil, described by Hussak, Centralbl. Min., 723, 1903; Hlawatsch, *ibid.*, 422, 1905; from Broken Hill with new forms  $m$  (110),  $f$  ( $\bar{1}02$ ),  $p$  (122),  $\delta$  (1.12.12). New elements given as  $a : b : c = 1.34497 : 1 : 1.11468$ .  $\beta = 72^\circ 23'$ . Hlawatsch, Zs. Kr., 42, 587, 1906.

**RATHITE**, App., p. 58. — A new orientation proposed by Solly so that the well-developed prism zone is vertical and the cleavage plane (001) of Baumhauer becomes (010) to correspond with the cleavage of jordanite, the corresponding forms of the two orientations being:

Baumhauer	100	010	001	403	095	20.27.0	20.27.15
Solly	100	001	010	110	011	101	111

Axial ratios according to Solly;  $a : b : c = 0.4782 : 1 : 0.5112$ .

Angles:  $010 \wedge 350 = 51^\circ 27'$ ;  $010 \wedge 111 = 70^\circ 45'$ . A list of 62 known forms given, 37 of them being new. Twinning; (074) shown in fine twin lamellae; (0.15.1), rare as a juxtaposed twin.

Cleavage  $\parallel$  (010); parting  $\parallel$  (100). F. conchoidal. H. = 3. G. = 5.412; 5.421.

Analyses by Jackson yield formula  $3\text{PbS} \cdot 2\text{As}_2\text{S}_3$ ; Pb, 51.37; S, 23.82; As, 24.81.

	Pb	S	As
I.	51.51	23.41	24.62 = 99.54
II.	51.62	23.62	24.91 = 100.15

Solly and Jackson, Min. Mag., **12**, 287; Solly, *ibid.*, **13**, 77; Zs. Kr., **35**, 321.

**REALGAR**, Min., pp. 33, 1046; App., p. 59. — Study of crystals from Allchar, with derivation of new elements;  $a : b : c = 0.7203 : 1 : 0.4858$ ,  $\beta = 66^\circ 16'$ . New *winkeltabelle* given. Goldschmidt, Zs. Kr., **39**, 113; crystals from Mercur, Utah; Farrington and Tillotson, Field Col. Mus., Geol. Series, **3**, No. 7, 158, 1908.

Occurs in crystals in the Monte Cristo mining district, Snohomish Co., Washington; Moses, Am. J. Sc., **12**, 103, 1901. Crystals formed at eruption of Vesuvius, 1906; see under Vesuvius. Occurrence in morainal material of Zei glacier in Caucasus; Orlovsky, [Proc. Soc. Imp. Nat. Moscow, No. 1-3, 17-18, 1897]; Zs. Kr., **31**, 518.

**REDONITE**, Min., p. 807. — Occurrence at Martinique with anal.; Lacroix, Bull. Min. Soc., **28**, 13, 1905.

**RESIN, MINERAL**. — Occurrence of amber in Roumania with discussion of fossil resins, succinite, rumänite, schraufite, simetite, burmite and a new type from Olănești; Murgoci, Asociațiunea Română pentru înaintarea și răspândirea științelor Memoriile Congresului de la Iasi, Bucurest, 1903.

**Reyerite**. F. Cornu and A. Himmelbauer. Min. Mitth., **25**, 519, 1907.

Rhombohedral. Crystals in thin hexagonal plates showing combination of base and prism. In radiating aggregates. Cleavage: basal perfect. H. = 3.5. G. = 2.499-2.578. Optically negative.  $\omega = 1.564$ . Etched with HCl gives triangular figures. Six-rayed percussion figure.

Composition. Calcium aluminium silicate with water. An incomplete analysis gave:

SiO <sub>2</sub>	CaO	Al <sub>2</sub> O <sub>3</sub>	H <sub>2</sub> O
53.31	32.22	3.72	6.73 = 95.98

Pyr., etc. — Difficultly fusible B. B. to a white enamel. Yields water in the closed tube. After heating gives an alkaline reaction. Decomposed by HCl.

Obs. on specimens from Greenland.

Named after Prof. E. Reyer of Vienna.

Compare *Gyrolite*.

**RHODOCHROSITE**, Min., p. 278; App., p. 59. — Occurrence (with anal.) at St. Barthélemy, Aosta, Italy; Millosevich, Rend. Acc. Linc., **15**, (1), 317, 1906.

**RHODONITE**, Min., pp. 378, 1046; App., p. 59. — Crystals described from St. Marcel, Piedmont, with analysis; Colomba, Accad. Sc. Torino, **39**, 664, 1904. Crom Chiaves and other localities in Valli di Lanzo, Italy, with anal.; Roccati, Att. Acc. Torino, **41**, 487, 1906; from Broken Hill, N. S. W., with following new forms: A (223), B (225), C (112), D (223), E (667), F (223), G (447), H (441), K (403), L (201); Anderson, Rec. Aus. Mus., **7**, 129, 1908.

Triclinic crystals lining cavities in a slag similar though not identical to those of rhodonite named *vogtite*, after Prof. H. L. Vogt of Christiania. Hlawatsch, Zs. Kr., **42**, 590.

**RHODUSITE**, see *Glaucophane*.

**Rhönite**. J. Soellner, Jb. Min., Beil., **24**, 475, 1907.

Triclinic. Isomorphous with ænigmatite.

Forms:  $b$  (010),  $a$  (100),  $m$  (110),  $\mu$  (110),  $c$  (001),  $r$  ( $\bar{1}\bar{1}1$ ),  $k$  (111),  $v$  ( $\bar{1}31$ ),  $i$  ( $\bar{1}31$ ). Angles, approximately measured under microscope, agree closely with those recorded for ænigmatite. Crystal habit, short prismatic or tabular parallel to  $b$  (010). Twinning pl.  $b$  (010). Cleavage good

parallel to  $m$  (110) and  $\mu$  ( $\bar{1}\bar{1}0$ ).  $G. = 3.58?$  Translucent to opaque. Color black to brown black, often showing metallic reflections. Streak red brown. Optically like *ænigmatite*.

Comp. Belongs in *ænigmatite* group, with much less amount of ferrous oxide and alkalies and increase in alumina, ferric oxide, lime and magnesia. Formula given is:  $(Ca, Na_2, K_2)_3Mg_4Fe^{II}_2Fe^{III}_3Al_4(Si, Ti)_6O_{20}$ .

Anal. by Dittrich of material from nepheline-basanite from Platz near Brückenau, Rhön:

SiO <sub>2</sub>	TiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	FeO	MnO	MgO	CaO	Na <sub>2</sub> O	K <sub>2</sub> O
24.42	9.46	17.25	11.69	11.39	tr.	12.62	12.43	0.67	0.63 = 100.56

Obs. Found like *ænigmatite*, as a constituent in basalts. First noted from Rhön, and identified also in similar rocks from Vogelsgebirge, Siebengebirge, Laacher-See, Odenwald, Kaiserstuhl, and in Bohemia. Named after Rhön district, where it was first identified.

**Rickardite.** *W. E. Ford*, *Am. J. Sc.*, **15**, 69, 1903. Massive. Fracture irregular. Brittle.  $H. = 3.5$ .  $G. = 7.54$ . Luster metallic. Color deep purple, resembling the color of tarnished surfaces of bornite, of the powder the same. Opaque.

Composition, a copper telluride,  $Cu_4Te_3$  or  $Cu_2Te_2CuTe$ . Analysis:

$$\frac{1}{2} Te, 59.21; \quad Cu, 40.74 = 99.95$$

B. B. alone on charcoal fuses easily ( $F. = 1$ ) to a brittle globule of copper telluride, gives a pale azure-blue flame tinged with green and forms a white coating of  $TeO_2$ ; with sodium carbonate and borax yields with difficulty metallic copper. In the open tube a faint sublimate of  $TeO_2$ . Dissolves in nitric acid; heated in concentrated sulphuric acid gives the characteristic reddish-violet color of tellurium.

Occurs at the Good Hope mine, at Vulcan, Colorado, in lens-shaped masses intimately associated with native tellurium, with petzite and berthierite; the vein mineral is chiefly pyrite; native sulphur is also found in the vein.

Named after Mr. T. A. Rickard of San Francisco.

**Ricolite**, var. of *serpentine*, which see.

**RIEBECKITE**, *Min.*, pp. 400, 1047; *App.*, p. 59. — Crystals from Narsarsuk, Greenland; *Flink*, [*Medd. om Grönl.*, **24**, 80, 1901]; *Min. Grönl.*, 430.

Genesis of; *Murgoci*, *Am. J. Sc.*, **20**, 133.

Occurrence in Roumania with anal.; *Mrazek*, [*Bull. soc. sc. Bucarest*, **8**, 106, 1899]; *Zs. Kr.*, **34**, 710. Occurrence in trachytic rocks from Abyssinia; *Prior*, *Min. Mag.*, **12**, 255, 1900.

**RINKITE**, *Min.*, p. 722. — New analysis by Christensen of material from Kangerdluarsuk agrees with that of Lorenzen (*Min.*, p. 722), except instead of 13.36%  $TiO_2$  there was found 5.42  $TiO_2$  and 6.51  $ZrO_2$ . *Böggild*, *Min. Grönl.*, 269.

**Rinneite.** *H. E. Boeke*, *Centralbl. Min.*, 72, 1909. Hexagonal. In coarsely granular masses. Perfect cleavage parallel to prism. Splintery fracture.  $H. = 3$ .  $G. = 2.34$ . Brilliant luster, often silky. Colorless when fresh and pure, usually rose, violet or yellow; becomes brown on exposure on account of oxidation. Optically +. Weak birefringence.

Comp.— $FeCl_2 \cdot 3KCl \cdot NaCl$ ;  $Fe$ , 13.67;  $K$ , 28.71;  $Na$ , 5.64;  $Cl$ , 51.99. Analysis:

	Fe	K	Na	Cl	Br
$\frac{1}{2}$	13.94	28.90	5.61	51.87	0.04 = 100.36

Easily fusible. Taste astringent like ink.

Found in salt beds at Nordhausen, Saxony, associated with carnallite, sylvite, etc. Named after Prof. F. Rinne.

**Robellazite.** — Preliminary announcement of a new species containing vanadium, niobium, tantalum, tungsten, aluminium, iron and manganese. In black concretions associated with carnotite from Colorado. Named after explorer who collected the specimens; *Cumenge*, *Bull. Soc. Min.*, **23**, 17, 1900.

**ROEMERITE**, *Min.*, p. 959. — Analyses of natural and artificial material lead to formula,  $FeSO_4 \cdot Fe_2(SO_4)_3 \cdot 14H_2O$ . *Scharizer*, *Zs. Kr.*, **37**, 529. Also an artificial roemerite containing 6.60 p. c.  $ZnO$ , which is called *zinc roemerite* in distinction from the ordinary *ferreroemerite*, *ibid.*, 546; on its decomposition; *Scharizer*, *ibid.*, **43**, 122.

**Rosasite.** *D. Lovisato*, *Rend. Acc. Linc.*, **17**, (2), 723, 1908.

In compact, fibrous masses, mammillary, of a bright green to sky-blue color. Silky luster on fresh fracture.  $H. = 4.5$ .  $G. = 4.07$ . Comp., perhaps  $2CuO \cdot 3CuCO_3 \cdot 5ZnCO_3$ . Analysis:  $CO_2$ , 30.44;  $CuO$ , 36.34;  $ZnO$ , 33.57;  $PbO$ , tr.;  $H_2O$ , 0.21; total, 100.56. Occ. at Rosas mine (whence the name rosasite) at Sulcis, Sardinia.

ROSCOELITE, Min., p. 635. — The carefully purified mineral from the Stockslager mine, Placer-ville, Cal., has been analyzed by Hillebrand, *Am. J. Sc.*, **7**, 451, 1899; mean result as follows:

	SiO <sub>2</sub>	TiO <sub>2</sub>	V <sub>2</sub> O <sub>5</sub>	Al <sub>2</sub> O <sub>3</sub>	FeO	MgO	K <sub>2</sub> O	Na <sub>2</sub> O	Li <sub>2</sub> O	H <sub>2</sub> O
G. =	2.97	45.17	0.78	24.01	11.54	1.60	1.64	10.37	0.06	tr. 4.69* = 99.86

\* Below 105°, 0.40; 105° to 280°, 0.17; above 280°, 4.12.

The above is shown by Clarke (*ibid.*, p. 454) to correspond to a molecular mixture in a ratio of 1 : 1 : 8 nearly, of H<sub>2</sub>KMg<sub>2</sub>FeAl(SiO<sub>4</sub>)<sub>3</sub>, H<sub>2</sub>K<sub>2</sub>Al<sub>2</sub>(Si<sub>2</sub>O<sub>7</sub>)<sub>3</sub> and H<sub>2</sub>KAlV<sub>2</sub>(SiO<sub>4</sub>)<sub>3</sub>. Turner (*ibid.*, p. 455) shows that roscelite occurs at four localities within a small area a few miles northwest of Placer-ville in Eldorado county, California.

ROSENBUSCHITE, Min., p. 374. — Occurrence in nephelite-syenite-porphry, Red Hill, Moulton-boro, N. H.; Pirsson and Washington, *Am. J. Sc.*, **23**, 433, 1907.

**Rosolite**, a garnet, which see.

**Rubrite**. — Correct name for the hydrous sulphate of ferric iron and magnesium originally misspelled "*kubelit*," see App., p. 21; Spencer, *Min. Mag.*, **12**, 386, 1900.

**RUBY**, see *Corundum*.

RUMÄNITE, Min., p. 1004. — Analyses; Istrati, [*Bull. soc. sc. Bucarest*, **6**, 55, 1897; **7**, 272]; *Zs. Kr.*, **32**, 187.

Concerning fossil resins from Rumania; name spelled "*romanite*." Murgoci [*Assoc. Română*, etc., Bucarest, 1903]; *Zs. Kr.*, **41**, 318.

RUMPFITE, Min., p. 661. — Occurrence at Passe von Wald, Austria; in pseudomorph after magnesite. Döll, [*Verh. geol. Reichsanst.*, Wien, 329, 1897]; *Zs. Kr.*, **32**, 183.

**Rutherfordine**. *W. Marckwald*, *Centralbl. Min.*, 761, 1906.

An ochre resulting from the alteration of uraninite.

Yellow color. Strongly radiocative. G. = 4.82.

Composition. Uranyl carbonate, UO<sub>2</sub>CO<sub>3</sub>; UO<sub>3</sub>, 83.5; CO<sub>2</sub>, 12.3. Analysis:

UO <sub>3</sub>	CO <sub>2</sub>	PbO	FeO	CaO	H <sub>2</sub> O	Gangue	
83.8	12.1	1.0	0.8	1.1	0.7	0.8	= 100.3

Occurs as an alteration product of uraninite associated with mica in the Uruguru Mts., German East Africa. Named from Prof. E. Rutherford.

RUTILE, Min., pp. 237, 1047; App., p. 60. — Crystals from Alpe Veglia, Varzo, Val d'Ossola, Italy; Lincio [*Att. Acc. Torino*, **39**, 995, 1904]; *Zs. Kr.*, **42**, 66; from Victor Harbour and Mount Gambier, So. Aus.; Anderson, *Rec. Aus. Mus.*, **7**, 1, 66, 1908. Crystal structure; Mügge, *Centralbl. Min.*, **72**, 1902; crystals from Jequitinhonha River, Brazil; Farrington and Tillotson, *Field Col. Mus.*, *Geol. Series*, **3**, No. 7, 160, 1908.

Refractive indices; Taubert [*Inaug.-Diss.*, Jena, 1905]; *Zs. Kr.*, **44**, 313.

Anal. from Graves Mt., Ga., and from Tavetsch, Switzerland; Pfeil [*Inaug.-Diss.*, Heidelberg, 1901]; *Centralbl. Min.*, 144, 1902.

Discussion of formulæ of rutile, octahedrite and brookite; Prior, *Min. Mag.*, **13**, 220.

Discussion of the regular grouping upon hematite tables from Cavradi; Baumhauer, *Sitz. Akad. Berlin*, 322, 1906; *Zs. Kr.*, **43**, 61. It is shown that the rutile prisms make angles of 2° 10' with the hematite diagonals instead of coinciding with them, the actual position being a mean between the latter position and that where a terminal cap of *s* (111) would coincide with the diagonal; see also Viola, *Rend. Acc. Line.*, **17**, (2), 437, 554.

SAL-AMMONIAC, Min., p. 157; App., p. 60. — Crystals from Burgk near Dresden; and from Vesuvius; Goldschmidt and Schröder, *Zs. Kr.*, **45**, 220, 221; from Vesuvius; Slavik, *Bull. Acad. Sci. Bohème*, 1907.

From Vesuvius; Matteucci, *Centralbl. Min.*, **45**, 1901. Occurrence in volcanic eruptions; Wegner, *ibid.*, 662, 1907.

SAMARSKITE, Min., pp. 739, 1037; App., p. 61. — Occurrence with anal. in bed of river Tschoroch, Batum, Caucasus Mts.; Tschernik, [*Jour. phys.-chim. Russe*, **34**, 684, 1892]; *Zs. Kr.*, **39**, 627. Occurrence in southern Norway with description of crystals and anal.; Brögger, *Min. Süd-Nor. Granitpeg.*, 138, 1908.

Radioactivity; Barker, *Am. J. Sc.*, **16**, 163, 1903. Ratio of radium to uranium; Boltwood, *Am. J. Sc.*, **18**, 97, 1904; also see under *Uraninite*.

**Sanfordite**, synonym of earlier name *Rickardite*, which see.

SAPPHIRINE, Min., p. 561. — Occurrence in rock with hypersthene and hercynite in Vizagapatam, Madras, India; anal.; Middlemiss, [Rec. Geol. Sur. India, **31**, 38, 1904]; Zs. Kr., **42**, 389.

SARCOLITE, Min., p. 474. — Optical study on crystals from Vesuvius gave:  $\omega = 1.6404$ ;  $\epsilon = 1.6566$  for Na; dispersion large,  $\rho > v$ ; birefringence = 0.01626; Opt. +; analyses; Pauly, Centralbl. Min., 266, 1906.

SARKINITE, Min., p. 779. — Crystallographically, optically and chemically species *chondroarsenite* (Min., p. 796) is proven to be identical with sarkinite. Sjögren, G. För. Förh., **28**, 401, 1906.

SARTORITE, Min., p. 113; App., p. 61. — Analyses by Jackson confirm the formula,  $PbS_2As_2S_3$ ; Solly and Jackson, Min. Mag., **12**, 286, 297. Considered to be monoclinic by Solly (loc. cit.) and Trechmann, Min. Mag., **14**, 212; Zs. Kr., **43**, 548, but both give different axial ratios. Trechmann from measurement of small crystals, concerning whose identity with sartorite there is some question, deduces  $a : b : c = 1.27552 : 1 : 1.19487$ ;  $\beta = 77^\circ 48'$ . He makes the brachydomes of vom Rath's orientation the prisms, and transposes the macrodomes into orthodomes. Tables are given including 87 forms and their comparison with the forms observed by earlier writers.

SASSOLITE, Min., p. 255. — Crystals from Tuscany; D'Achiardi, [Ann. Univ. Tosc., **23**, 1, 1900]; Zs. Kr., **35**, 519.

SCAPOLITE, Min., p. 466; App., p. 61. — Scapolite rocks from Alaska; Spurr, Am. J. Sc., **10**, 310, 1900.

SCELELITE, Min., p. 985; App., p. 61. — Crystals from Nordmark; Flink, Bull. G. Inst. Upsala, **5**, 96, 1901; from Traversella with the new forms: (885), (714), (735), (756), (232), also less certain (323), (21.1.11); mean value of  $d = 1.53798$ ; Colomba, Rend. Acc. Linc., **15**, (1), 281, 1906; other new forms from Traversella, (338), (227), (507), (407)?; Zambonini, *ibid.*, 558, 1906; from Hillgrove, N. S. W., and Mount Ramsay, Tasmania; Anderson, Rec. Aus. Mus., **6**, 414, 1907.

Luminescence; Pochettino, Rend. Acc. Linc., **14**, (1) 505, (2), 220, 1905.

Analyses of material from Traversella gave:

	WO <sub>3</sub>	MoO <sub>3</sub>	CaO	MgO	
Colorless	77.03	3.15	19.73	...	= 99.91
Reddish brown	77.35	2.46	18.33	1.67	= 99.81
Greenish brown	78.75	1.47	19.23	0.55	= 100.00
Orange-yellow	79.68	0.72	19.43	tr.	= 99.83

Colomba, loc. cit.

Artif.; de Schulten, Bull. Min. Soc., **26**, 112, 1903.

Occurrence with anal., at Villa Salto, Sardinia; Traverso, [Resocconti delle Riunioni d. Soc. Min. Sarda, Iglesias, **6**, 8, 1901]; Zs. Kr., **37**, 396; from the Mutsch in the Etlzlithal, Switzerland (anal. by Hinden); Schmidt, Zs. Kr., **36**, 160, 1902; see also *ibid.*, **24**, 137, 1895. At Trumbull, Conn.; Hobbs, U. S. G. S., 22d. Ann. Rep., **2**, 7, 1902; Zs. Kr., **38**, 698; occurrence (with anal.) at Marianna de Itacolomy, Minas Geraës, Brazil; Florence, Centralbl. Min., 727, 1903; near Barkerville, N. C.; Atkin, Geol. Mag., **2**, 116, 1905; in eruptive rocks at Predazzo, Tyrol; Block, Ber. Naturhist. Ver. Bonn, **2**, A, 68, 1905; at Murri and Orroli, Cagliari, Sardinia; Lovisato, Rend. Acc. Linc., **16**, (1), 632, 1907; in pegmatite at Dinan Côtes du Nord, France; Lacroix, Bull. Soc. Min., **31**, 349, 1908.

SCHEFFERITE, see *Pyroxene*.

Schertelite. *Schertalite*. *Muellerite*. R. W. Emerson MacIvor, Ch. News, **85**, 182 and 217, 1902. Zs. Kr., **42**, 386, 1906.

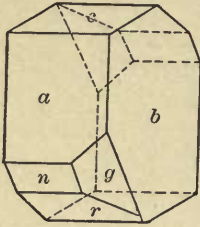
Comp.  $Mg(NH_4)_2H_2(PO_4)_2 + 4H_2O = P_2O_5$ , 43.83; MgO, 12.35;  $(NH_4)_2O$ , 16.05;  $H_2O$ , 27.77. Analysis:

P <sub>2</sub> O <sub>5</sub>	MgO	(NH <sub>4</sub> ) <sub>2</sub> O	H <sub>2</sub> O
43.88	12.42	16.15	27.55 = 100.00

Occurs in small indistinct flat crystals sparsely distributed in the bat guano deposits found in basaltic caves near Skipton, thirty miles southwest of Ballarat, Australia. Originally named from Baron Sir Ferdinand von Mueller, the name being subsequently withdrawn on account of the same name having been previously given to another species. Schertalite is an incorrect spelling. Named from Prof. Arnulf Schertel.

**Schizolite.** *Chr. Winther*, *Medd. om Grönland*, **24**, 196, 1901; *O. B. Böggild*, *ibid.*, **26**, 121, 1904.

Triclinic:  $a : b : c = 1.10613 : 1 : 1.98629$ .  $\alpha = 90^\circ 11'$ ;  $\beta = 94^\circ 45\frac{3}{4}'$ ;  $\gamma = 103^\circ 7\frac{1}{4}'$ . Forms:  $a$  (100),  $b$  (010),  $c$  (001),  $o$  (530),  $m$  (110),  $P$  (230),  $M$  ( $\bar{1}\bar{1}0$ ),  $l$  (120),  $r$  ( $\bar{1}02$ ),  $n$  ( $\bar{1}01$ ),  $s$  ( $\bar{2}01$ ),  $e$  ( $\bar{1}\bar{1}1$ ),  $g$  ( $\bar{1}\bar{1}\bar{1}$ ),  $f$  ( $\bar{1}\bar{4}1$ ). Angles  $ac = 85^\circ 4'$ ,  $bc = 88^\circ 42'$ ,  $ab = 76^\circ 49'$ ,  $ra = 69^\circ 31\frac{1}{2}'$ ,  $na = 50^\circ 12'$ ,  $gb = 47^\circ 1'$ .



Schizolite.

Schizolite.	SiO <sub>2</sub>	TiO <sub>2</sub>	Ce <sub>2</sub> O <sub>3</sub>	FeO	MnO	CaO	Na <sub>2</sub> O	H <sub>2</sub> O
	51.06	0.68	1.47	2.79	12.90	19.48	10.71	1.36 = 100.45

From the nephelite-syenite region of Julianehaab, southern Greenland; found in 1897 by G. Flink (*Medd. om Grönland*, **14**, 257, 1898) at Tutop Agdlerkofia, where it occurs in granular albite with ægirite, steenstrupite, sphalerite; also at Kangerdluarsuk embedded in pegmatite with eudialyte, arfvedsonite, etc. Named from  $\sigma\chi\zeta\omega$ , to cleave, in allusion to the marked cleavage.

A related mineral, obtained by G. Flink from Naujakasik in the same region, is provisionally regarded as a variety of schizolite by Winther. It occurs in small indistinct cube-like crystals, also in plates.

H. = 5-5.5. G. = 3.084. Luster greasy to vitreous. Color brown.

Analysis, Chr. Christiansen:

SiO <sub>2</sub>	Y <sub>2</sub> O <sub>3</sub>	FeO	MnO	CaO	MgO	Na <sub>2</sub> O	H <sub>2</sub> O
51.44	2.40	2.01	11.69	20.53	0.13	9.50	2.25 = 99.95

The percentage composition is closely that of manganopectolite. It is regarded as a partly altered schizolite.

**SCHNEEBERGITE**, *Min.*, p. 862; *App.*, p. 61. — The determination of schneebergite to be a garnet, see *App. I*, p. 28, is proven to be erroneous and that it is an individual species near *atopite* as originally described. The material analyzed by Eakle and Muthmann was a garnet similar in appearance to schneebergite and associated with it. Index of refraction determined,  $n = 2.10$ , (Hlawatsch); *Koehlin*, *Min. Mitth.*, **21**, 15, 87, 1902.

**SCHRÖTTERITE**, *Min.*, p. 694. — A mineral associated with melite (q. v.) from Saalfeld has been analyzed by Zambonini and shown to belong here, *Zs. Kr.*, **32**, 162, 1899; **34**, 226, 1901.

**SCHOENITE**, *Min.*, p. 948. — See *Picromerite*.

**SCHORLOMITE**, *Min.*, p. 447. — Occurrence (with anal.) in nepheline-syenite rocks on Ice River in Rocky Mts., British Columbia; *Hoffmann*, *Am. J. Sc.*, **11**, 150, 1901.

**Scleropasthite.** *W. F. Petterd*, *Notes on Minerals Occurring in Tasmania*, 1902. — Occurs in compact felted masses, very hygroscopic and extremely tough under the hammer; these consist of minute, short, silky white fibers and the surface is often nodular and rough. An analysis gave:

SO <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	Cr <sub>2</sub> O <sub>3</sub>	Ign.	gangue
27.20	14.0	10.64	39.19	10.77 = 101.80

Occurs associated with a sulphate provisionally referred to *knoxvillite*, q. v.

**SOLECITE**, *Min.*, p. 604; *App.*, p. 61. — Crystals from Karsuanguit-Kakait, Greenland, with determination of indices of refraction and anal. by Ussing; *Böggild*, *Min. Grönl.*, 539.

Anal. of material from Werris Creek, N. S. W.; *Anderson*, *Rec. Aus. Mus.*, **6**, 421, 1907.

Action of ammonium chloride upon; *Clarke and Steiger*, *Am. J. Sc.*, **9**, 345, 1900; discussion of chem. comp.; *Zambonini*, *Mem. Acc. Sci. Napoli*, **14**, 119, 1908.

Occurrence with anal. from Cala Francese, Maddalena island; *Rimatori*, *Rend. Acc. Linc.*, **11**, (1), 542, 1902; occurrence on island of Suderö; *Görgy*, *Centralbl. Min.*, 525, 1908.

**SCORODITE**, *Min.*, p. 821; *App.*, p. 61. — Crystals from Schlaggenwald, Bohemia; *Slavik*, *Zs. Kr.*, **39**, 298, 1904; from Nadabula, Gömör, Hungary; *Zimányi*, *Földt. Közl.*, **35**, 545, 1905.

**Seligmannite.** *H. Baumhauer*, *Ber. Ak. Berlin*, 110, 1901; *ibid.*, 611, 1902; *Solly*, *Min. Mag.*, **13**, 336; *ibid.*, **14**, 186.



Orthorhombic.  $a : b : c = 0.92332 : 1 : 0.87338$  (Solly). Angles:  $(011) \wedge (001) = 41^\circ 8'$ ;  $(100) \wedge (101) = 46^\circ 35'$ ;  $(010) \wedge (120) = 28^\circ 26'$ . In small complex crystals; 57 forms having been observed. Closely related crystallographically with bournonite. Almost always twinned about (110), also at times ( $\bar{1}10$ ).

Color lead gray; metallic luster; chocolate streak; conchoidal fracture.  $H. = 3$ .

Composition. Qualitative determinations gave copper, lead, sulphur and arsenic. From crystallographic relations to bournonite it is supposed to be isomorphous with it and to have formula  $Cu_2S.2PbS.As_2S_3$ .

Occ. in Lengenbach quarry, Binnenthal. Named after G. Seligmann of Coblenz.

SEMSEYITE, Min., p. 123; App., p. 61. — From Oruro, Bolivia, with anal.; Spencer, Min. Mag., 14, 314.

See under *Plagionite*.

SENAITE, App., p. 62. — New analyses of material from near Diamantinas, Brazil, lead to formula  $(Fe,Mn,Pb)O.TiO_2$ .

	TiO <sub>2</sub>	ZrO <sub>2</sub>	FeO	MnO	PbO	MgO
I. Dattas.	52.11	....	26.97	10.42	10.86	0.32 = 100.68
II. Curralinho.	50.32	0.84	21.99	17.58	9.62	.... = 100.35

Hussak and Reiting, Zs. Kr., 37, 574.

SENARMONTITE, Min., p. 198; App., p. 62. — Relations to valentinite; Weber, Zs. Kr., 44, 232. Article referred to in App. I should be accredited to Lovisato.

SEPIOLITE, Min., p. 680; App., p. 62. — Analysis of meerscham from Gröschelmann, south of Mährisch-Budwitz, West Mähren, Bohemia; Kovář, [Progr. d. čechosl. Handelsakademie, Prag, 1903]; Zs. Kr., 39, 400. Comp. of; Fogy, Ber. Ak. Wien, 115, June, 1906. Discussion of chem. comp.; Zambonini, Mem. Acc. Sci., Napoli, 14, 77, 1908.

Serendibite. G. T. Prior and A. K. Coomaraswamy, Min. Mag., 13, 224, 1903.

Occurs in irregular grains showing polysynthetic twinning, analogous to the feldspars; probably triclinic or monoclinic.

Cleavage none. Fracture subconchoidal.  $H. = 6.75$ .  $G. = 3.42$ . Luster vitreous. Color blue, varying from pale sky-blue to deep indigo-blue. Pleochroism marked, in one variety pale yellow (almost colorless) to pale sky-blue, in another pale brownish yellow to deep indigo-blue. Biaxial; birefringence weak. Refractive index about 1.7. Extinction nearly symmetrical and at about  $15^\circ$ , in two sets of twin lamellæ, each of which shows an optic axis nearly central.

Composition a basic silicate of aluminium, calcium and magnesium, perhaps  $10RO.5Al_2O_3.B_2O_3.6SiO_2$ .

Analysis, G. T. Prior:

SiO <sub>2</sub>	B <sub>2</sub> O <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub>	FeO	CaO	MgO	Na <sub>2</sub> O(Li <sub>2</sub> O)	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	F?	Ign.
25.33	[4.17]	34.96	4.17	14.56	14.91	0.51	0.22	0.48	undet.	0.69 = 100

B. B. infusible; with calcium fluoride and acid potassium sulphate yields a green boron flame. Only slightly attacked by acids.

Found on Ceylon at Gangapitiya near Ambakotte and 12 miles from Kandy; occurs in contact zones between bands of granulite and of limestone, associated with diopside, blue spinel, apatite, scapolite and plagioclase. This locality is worked for Ceylon moonstone, which occurs in large porphyritic crystals in the granulite (cf. Q. J. G. Soc., 58, 421, 1902). Named from Serendib, an old Arab name of Ceylon.

SERPENTINE, Min., pp. 669, 1047; App., p. 62. — Analyses of material from Ceylon; Grünling, Zs. Kr., 33, 219, 1900; from near Easton, Pa.; Eyerman, Amer. Geol., 34, 47, 1904; comp. of; Fogy, Ber. Ak. Wien, 115, June, 1906. Analyses of three varieties of serpentine with discussion of chem. comp.; S. Hillebrand, Ber. Ak. Wien, 115, 697, 1906. Loss of water on heating and discussion of chem. comp.; Zambonini, Mem. Acc. Sci., Napoli, 14, 19, 1908.

Microscopic structure; Bonney and Raisin, Jour. Geol. Soc., 61, 690, 1905.

Study of serpentines from Kutteneberg, Bohemia, with anal.; Bukovský [Programm des Real-schule in Kutteneberg, 1906]; Zs. Kr., 45, 403.

Occurrence in Vermont; Ver. Geol. Sur. Ann. Rep. 1903-1904; Am. J. Sc., 19, 395. A serpentine rock from Tarnthaler-Köpfe, Tyrol; Young, Min. Mag., 14, 365, 1907.

Variety bowenite from Shigar, Baltistan, Cashmere, with anal.; McMahon [Mem. Geol. Surv. India, 31, 312, 1901]; Zs. Kr., 37, 310.

Pseudocubic *antigorite* from Persberg, Wermland, and from Kogrube, Nordmarken, with analyses; Hamberg, G. För. Förh., 26, 67, 1904.

On the identity of the Amiantos or Karystian stone of the ancients with chrysotile; Evans, Min. Mag., **14**, 143, 1906.

*Ricolite*, name given to a banded variety of serpentine from Mexico. Name derived from Spanish "rico," in allusion to the rich green color of the stone. Merrill, Stones for Building and Decoration, pp. 365, 366.

*Nemaphyllite* is a variety containing 2 p. c. soda, occurring in regular intergrowth with dolomite at Wildkreuzjoch in the Zillerthal, Tyrol; Fr. Focke, Min. petr. Mitth., **21**, 323, 1902. In coarse scaly to foliated masses resembling the chlorites; the folia also fibrous in structure, whence the name given.

Cleavage perfect, yielding elastic folia.  $H. = 3$ .  $G. = 2.60$ . Luster silky or pearly. Color bluish green to greenish gray. Birefringence negative, weak. Axial plane parallel to the direction of fibrous structure.  $Bx_a(a)$  somewhat inclined to the normal to the folia.

Analysis, R. v. Zeyneck.

SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	FeO	MgO	CaO	Na <sub>2</sub> O	H <sub>2</sub> O
42.49	0.40	4.63	37.60	0.72	2.11	13.11 = 101.06

See *Asbestos*.

**SIDERITE**, Min., pp. 276, 1047; App., p. 62. — Crystals from Traversella; Colomba, Rend. Acad. Linc., **15**, 637, 1906; from Frigido near Massa, Italy, (with anal.); Manasse, Att. Soc. Tosc., **22**, 81-93, 1906. Scalenohedral crystals with new forms, *l* (7075); *K* (5052); *y* (3251), from near Frostburg, Md.; Schaller, Am. J. Sc., **21**, 364, 1906; crystals with danalite, Gloucester, Mass.; Palache, *ibid.*, **24**, 253, 1907; Zs. Kr., **44**, 18; crystals from Chorolque and Tatasi, Bolivia; Spencer, Min. Mag., **14**, 342, 1907; from Cornwall with new forms,  $\Delta$  (7072), *l* (3031); Henglein, Zs. Kr., **43**, 575, 1907.

Chemical and optical study of material from Camborne, Cornwall; Hutchinson, Min. Mag., **13**, 209, 1903.

Containing MgCO<sub>3</sub> to FeCO<sub>3</sub> as 1:3 (anal.) from Bottino, Tuscany; Manasse, Proc. Soc. Tosc., **15**, 20-37, 1906.

An iron-manganese carbonate related to the oligonite (oligonspath) of Breithaupt (Dana, Min., p. 277) has been called manganospherite by Busz, Jb. Min., **2**, 129, 1901. It resembles spherosiderite, occurring in botryoidal or reniform aggregates, the surface spangling with very minute rhombohedral faces; also occurs in fine-fibrous forms resembling chrysotile.  $H. = 4.5-5$ .  $G. = 3.630$ . Color brown with tinge of red.

The composition corresponds to 3FeCO<sub>3</sub>.2MnCO<sub>3</sub> as given by the analysis: CO<sub>2</sub>, 38.34; FeO, 36.72; MnO, 24.76 = 99.82.

This mineral has been found in cavities or in thin cracks in basalt (*limburgite*) which crosses the siderite deposits at the Louise mine near Horhausen, Westerwald, Germany. The chrysolite (olivine) crystals of the basalt have been in part replaced by manganospherite.

**SIDERONATRITE**, Min., p. 973. — Artif. formation and discussion of chem. comp.; Scharizer, Zs. Kr., **41**, 215.

**Silicomagnesiofluorite**. *P. Zemiattschensky*, Zs. Kr., **42**, 209, 1906.

In aggregates of half-spherical or spherical forms with fibrous-radiated structure.

$H. = 2.5$ .  $G. = 2.913$  (v. Isküll). Luster silky. Color ash-gray, also light greenish or bluish. Birefringence weak, positive; extinction parallel.

Composition, a fluosilicate of calcium and magnesium essentially, with perhaps the empirical formula  $H_2Ca_4Mg_3Si_2O_7F_{10}$ .

Analysis:

SiO <sub>2</sub>	Fe <sub>2</sub> O <sub>3</sub>	CaO	MgO	H <sub>2</sub> O	F	Mn <sub>2</sub> O <sub>4</sub>	SO <sub>3</sub>
19.86	2.30	38.48	18.27	5.90	31.01	0.06	0.27 = 116.15 (less O = 13.06) = 103.09

Disregarding the manganese and a portion of the iron and taking the remainder of the latter as FeO, the following are obtained as the results of the analysis: Si, 9.34; Ca, 27.54; Mg, 11.03; Fe, 1.61; H, 0.33; F, 31.01; O, 18.85 = 99.71.

B. fuses rather easily to a clouded greenish glass; yields water in the closed tube, also reacts for fluorine. Soluble in acids.

From Lupikko, near Pitkäranta, Finland; probably occurs with serpentine.

**SILLIMANITE**, Min., p. 498; App., p. 62. — Study of crystal from Chester, Conn., gave following forms: (110), (230), (120), (052). Axial ratio derived from measurements:  $a : b : c = 0.9696 : 1 : 0.7046$ . Taubert, Centralbl. Min., **372**, 1906.

From Ceylon with determination of optical constants; Grünling, Zs. Kr., **33**, 253, 1900. Refractive indices; Taubert, [Inaug.-Diss., Jena, 1905]; Zs. Kr., **44**, 314.

Conversion of cyanite and andalusite into sillimanite by heating to about 1350°; Beekman, [Veslag Wis-en Nat. Kon. Akad. Wetenschappen te Amsterdam, **11**, 1,295, 1902]; Zs. Kr., **39**, 395.

- SILVER**, Min., p. 19; App., p. 62. — Structure planes; Mügge, Jb. Min., 2, 59, 1899. Origin discussed; Vogt, Zs. prakt. Geol., 113, 177, 1899. Occurrence on Lake Temiskaming, Ontario, Canada; Miller, Rep. Can. Bureau of Mines, 2, 1905; Zs. Kr., 43, 395.
- SLOANITE**, Min., p. 610. — See under *Natroilite*.
- Smaltite**, Min., p. 87. — Crystals from Cobalt, Ontario; Miller, Rep. Can. Bureau Mines, 2, 1905; Zs. Kr., 43, 395.
- Smithite**. *R. H. Solly*, Min., Mag., 14, 74, 1905. *G. F. Herbert Smith* and *G. T. Prior*, *ibid.*, 14, 293, 1907.  
Monoclinic. Axes  $\dot{a} : \dot{b} : \dot{c} = 2.2309 : 1 : 1.9657$ ;  $\beta = 78^\circ 47'$  (Solly). Smith gives slightly different constants. Angles (by Solly):  $(100) \wedge (101) = 42^\circ 22'$ ;  $(100) \wedge (10\bar{1}) = 55^\circ 0'$ ;  $(100) \wedge (111) = 63^\circ 24'$ . Forms: Fifty-seven observed forms, of which the most prominent are:  $a$  (100),  $c$  (001),  $e$  (101),  $d$  ( $\bar{1}01$ ),  $p$  (111),  $P$  ( $\bar{1}11$ ),  $r$  (311),  $R$  ( $\bar{3}11$ ),  $q$  (211),  $Q$  ( $\bar{2}11$ ),  $l$  (320).  
In crystals resembling a flattened hexagonal pyramid, formed by a prominent and the zones  $ac$ ,  $ap$ ,  $aP$  equally developed.  
Cleavage  $a$  highly perfect. Fracture conchoidal. Brittle.  $H. = 1.5-2$ .  $G. = 4.88$ . Luster adamantine.  
Color light red, changing to orange-red on exposure to light. Streak vermilion.  
Composition,  $Ag_2S.As_2S_3 = AgAsS_3$ ;  $Ag = 43.69$ ;  $As = 30.36$ ;  $S = 25.95$ .  
Anal. yielded  $Ag, 43.9$ ;  $As, 28.9$ ;  $Sb, 0.4$ ;  $S, 26.0 = 99.2$ .  
Occurs in the white dolomite of the Lengbach quarry in the Binnenthal, Switzerland; it is associated with hutchinsonite, sartorite and rathite.  
Named after Mr. G. F. Herbert Smith of the Mineral Department of the British Museum, London.
- SMITHSONITE**, Min., p. 279; App., p. 63. — Crystals from San Aniceto, Almaden, Spain, with new form (105); Buttgenbach, Bull. Soc. Min., 29, 190, 1906; pseudomorphs after calcite and anglesite; Millosevich, Rend. Acc. Linc., 9, (1), 153, 1900.  
Anal. of material from Morning Star mine, Searcy Co., Arkansas, containing 1.06% CdO; Miller, Amer. Chem. Jour., 22, 218, 1899.  
Occurrence at Freiberg, Saxony; Bergt, Ber. Abh. Naturwiss. Ges. Isis, Dresden, p. 20, 1903; at Broken Hill, N. W. Rhodesia; Min. Mag., 15, 35, 1908.
- SODALITE**, Min., p. 428; App., p. 63. — Crystals with new form (321) formed at eruption of Vesuvius in 1906; see under Vesuvius.  
Refractive indices; Gaubert, Bull. Soc. Min., 28, 194, 1905.  
Effect of ammonium chloride upon; Clarke and Steiger, U. S. G. S., Bull. 207, 1902; Zs. Kr., 38, 697.  
Artif. formation of a sodalite containing lithium and bromine; Weiberg, [Ann. Uni. Varsovie, 3, 1, 1905]; Zs. Kr., 44, 83.  
Sodalite syenite in Kishengarh, Rajputana, India; Vredenburg, [Rec. Geol. Sur. India, 31, 43, 1904]; Zs. Kr., 42, 390.  
A bright carmine-red variety from Rajputana lost its color on exposure to the light, changing to a dull gray, but regained it when kept in the dark. T. H. Holland, Nature, 74, 550, 1906; cf. also Currie, *ibid.*, p. 564.
- SODA NITER**, Min., p. 870. — Study of crystallizing solutions; Miers and Chevalier, Min. Mag., 14, 123, 1906.
- Soretite**. *L. Duparc* and *F. Pearce*, Mem. Soc. Phys. Genève, 34, 1902; Bull. Soc. Min., 26, 126, 1903. — An amphibole from the basic rocks of Koswinsky, north Urals; named after Professor Charles Soret. See *Amphibole*.
- Souesite**. *G. C. Hoffmann*, Am. J. Sc., 19, 319, 1905. — See *Awaruite*.
- SPANGOLITE**, Min., p. 919; App., p. 63. — Forms a soft, scaly bluish green coating on chryso-colla at the Metcalf mine, Clifton district, Arizona; microscopic hexagonal crystals were noted. Lindgren and Hillebrand, Am. J. Sc., 18, 459, 1904.
- Speculite**. *E. H. Liveing*, Eng. Min. Jour., 75, 814, 1903. — Name given to a specular gold and silver telluride from Kalgoorlie, West Australia, resembling sylvanite in color and cleavage but said to differ in chem. comp.

**SPERRYLITE**, Min., p. 92; App., p. 63. — Crystals from the Vermillion mine, Algoma District, Ontario, described by Nicol and Goldschmidt, (Zs. Kr., **38**, 58, 1903; Am. J. Sc., **15**, 450, 1903), showed the following new forms: *f* (310), *k* (520), *l* (530), *g* (320), *p* (221),  $\mu$  (411), *m* (311), *n* (211), *B* (533), *t* (421), *s* (321); cf. also Dickson, Am. J. Sc., **15**, 137, 1903.

Occurrence with covellite at Rambler Mine, Medicine Bow Mts., Wyoming; Wells and Penfield, Am. J. Sc., **13**, 95, 1902.

**SPHÆRITE**, Min., p. 845. — Anal. of material near sphærite in comp. from Gross-Tresny, Mähren; Kovář, [Abh. böhm. Akad., No. 15, 2, 1896]; Zs. Kr., **31**, 525.

**SPHÆROCOBALTITE**, Min., p. 280. — Anal. from Libiola near Casarze, Liguria, Italy; Ferro, [Att. Soc. Ligustica Sc. Nat. e Geog. Genova, **10**, 264, 1899]; Zs. Kr., **34**, 302.

**SPHALERITE**, Min., pp. 59, 1048; App., p. 63. — Cryst. — Galena, Kansas, with new form  $\sigma$  (833) (?); Rogers, Am. J. Sc., **9**, 134, 1900. Twins from Mies, Bohemia, with new form *y* (144); Mühlhauser, Min. Mitth., **20**, 83, 1901. Crystals from Ivigtut, Greenland; Böggild, Min. Groenland, **35**; from marble of Carrara; D'Achiardi, Att. Soc. Tosc. Sc., Mem. **21**, 1905; Traversella with new form (632); Colomba, Rend. Acad. Linc., **15**, 640, 1906; Bojeza, Siebenbürgen, Hungary; Toborffy, Zs. Kr., **44**, 603, 1908; Tuckahoe, Mo.; Farrington and Tillotson, Field Col. Mus., Geol. Series, **3**, No. 7, 161, 1908. Study of crystal forms and etching figures; Hochschild, Jb. Min., Beil., **26**, 151-212, 1908.

Chemical and spectroscopic study (presence of Cd, In, Ga) of specimens from Sardinia; Rimatori, Rend. Acc. Linc., **12**, (1), 263, 1903; *ibid.*, **14**, 688, 1905. Cadmium content; Biewend, [Berg-u. Hütten. Ztg., Leipzig, **61**, 401, 413, 425, 1902]; Zs. Kr., **40**, 506.

With metallic luster from Cornwall (?) with anal.; Miers, Min. Mag., **12**, 111; from Binnenthal; Solly, Min. Mag., **14**, 81.

Polymorphous relations to wurtzite; Weber, Zs. Kr., **44**, 212.

**SPINEL**, Min., pp. 220, 1048; App., p. 63. — Indices of refraction of blue spinel from Ceylon; Grünling, Zs. Kr., **33**, 259.

Anal. of *pleonaste* from Unter-Lhota, Mähren; Kovář, [Abh. böhm. Akad., **28**, 1899]; from Ceylon and *pleonaste* from Fassathal, Tyrol; Pfeil, [Inaug.-Diss., Heidelberg, 1901]; Centralbl. Min., **146**, 1902. Occurrence of *pleonaste* accompanied by amphibole in a rock on island of Elba, with anal.; P. Aloisi, Proc. Soc. Tosc., July, 1906.

Manganese spinel in slag from Menyháza, Hungary, with anal.; Krenner, Zs. Kr., **43**, 473; chem. comp.; Loezka, Zs. Kr., **43**, 571.

Synthetic; Smith, Min. Mag., **15**, 153, 1908.

**Spodiophyllite**. *G. Flink*, Medd. om Grönland, **14**, 232, 1898; **24**, 85, 1901.

In rough elongated hexagonal prisms with *c* resembling chlorite, *m* faces deeply striated; also in triangular plates twinned (60° about the vertical axis).

Cleavage, basal perfect, micaceous. Brittle, laminae not flexible nor elastic.  $H. = 3 - 3.25$ .  $G. = 2.633$ . Luster on cleavage faces pearly, otherwise glimmering or dull. Color ash-gray, on *c* often pearl-gray. Translucent to transparent. Optically uniaxial, negative; birefringence weak.

Composition,  $(Na_2, K_2)(Mg, Fe)_3(Fe, Al)_2(SiO_3)_8$ .

Analysis, *G. Flink*:

SiO <sub>2</sub>	Fe <sub>2</sub> O <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub>	FeO	MnO	MgO	Na <sub>2</sub> O	K <sub>2</sub> O
53.61	11.24	4.27	4.13	0.64	10.16	8.55	7.80 = 100.40

*B. B.* fuses slowly to a clear, nearly colorless glass; reacts for iron with the fluxes. Not attacked by acids.

Occurs very sparingly at Narsarsuk in southern Greenland, sometimes embedded in crystals of *ægirite*; also associated with zircon, ancylite, rhodochrosite, albite.

Named from *σπῆδιος*, ash-gray, and *φύλλον*, leaf.

**SPODUMENE**, Min., p. 366. — Anal. from Čichov, near Trebitsch in Mähren; Kovář, [Zs. chem. Indus., **10**, 1900]; Zs. Kr., **36**, 204.

Occurrence on Walrus Island, James Bay, Ungava dist., Northeast Territory, Canada; Hoffmann, Am. J. Sc., **11**, 152, 1901; in tourmaline-bearing pegmatites in Madagascar; Lacroix, Bull. Soc. Min., **31**, 239, 1908.

*Kunzite*. *Kunz*; Am. J. Sc., **16**, 265, 1903; *Baskerville*, Science, **18**, 304, 1903; *Schaller*, Univ. Calif. Bull. Geol., **3**, 265, 1903; *Baskerville* and *Kunz*, Am. J. Sc., **18**, 25, 1904; *Davis*, Am. J. Sc., **18**, 29, 1904. — A clear lilac-colored variety of *spodumene* found near Pala, San Diego Co., California. The crystals, some of which weighed from 500 g. to 1000 g., are tabular, lengthened parallel to *c* axis. The following faces were observed: *a* (100), *b* (010), *l* (320), *m* (110), *n* (130), *A* (350).

Shows strong phosphorescence, with an orange-pink light through excitation by oscillating electric discharge, by ultra violet rays, by X-rays or by radium emanations. Analysis by Davis gave:

SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	NiO	MnO	ZnO	CaO	K <sub>2</sub> O	Na <sub>2</sub> O	Li <sub>2</sub> O	Ign.
64.05	27.30	0.06	0.11	0.44	0.80	0.06	0.30	6.88	0.15 = 100.15

Used as a gem stone. Named after Dr. G. F. Kunz of New York City.

**Spurrite.** *F. E. Wright*, *Am. J. Sc.*, **26**, 547, 1908. Probably monoclinic. In granular masses. Two cleavages, one good, second fair. Cleavage angle = 79°. In thin section twinning noted on two different planes. Fracture uneven to splintery. Brittle.  $H. = 5$ . Vitreous to resinous luster. Color pale gray with tints of blue, or yellow to colorless. Transparent to translucent.  $2V = 39.5^\circ$  approx. Birefringence strong, negative. Crossed dispersion.  $\alpha_{Na} = 1.640$ ;  $\beta_{Na} = 1.674$ ;  $\gamma_{Na} = 1.679$ .

Comp.,  $2Ca_2SiO_4 \cdot CaCO_3$ ; SiO<sub>2</sub>, 27.13; CaO, 62.98; CO<sub>2</sub>, 9.89.

Analysis by E. T. Allen:

SiO <sub>2</sub>	TiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	<u>Fe<sub>2</sub>O<sub>3</sub> FeO</u>	MnO	MgO	CaO	Na <sub>2</sub> O	K <sub>2</sub> O	CO <sub>2</sub>
26.96	0.01	0.39	0.11	0.03	0.23	62.34	0.05	tr.	9.73 = 99.85

B. B. gives strong calcium flame, loses its glassy luster but does not fuse. Found in contact zone between limestone and diorite in Velardeña mining district, Mexico, associated with gehlenite and hillebrandite. Named in honor of Mr. J. E. Spurr the geologist.

**STANNITE**, *Min.*, p. 83; *App.*, p. 64. — *Spencer* (*Min. Mag.*, **13**, 54) studying crystals from Oruro, Bolivia, shows them to be tetragonal, sphenoidal, but pseudo isometric through twinning. Following forms identified:  $c$  (001),  $a$  (100),  $m$  (110),  $e$  (101),  $z$  (201),  $d$  (114),  $n$  (112),  $p$  (111),  $t$  (221),  $-n$  (112),  $-p$  (111),  $u$  (423). Twinning, (1) always interpenetrant with  $e$  (101) as twinning pl., (2) interpenetrant with twin axis  $\perp$  to  $p$  (111). Anal. given. Regular grouping of crystals on tetrahedrite, from Oruro, Bolivia; *id.*, *ibid.*, **14**, 327.

**Stantienite.** *E. Pieszczyk* [*Archiv. f. Pharmacie*, [iii], **14**, 433], [*Jour. Chem. Soc. Abstracts*, **40**, 687, 1881]; *Min. Mag.*, **12**, 392. A black resin occurring with Prussian amber.

**STAUROLITE**, *Min.*, p. 558; *App.*, p. 64. — Occurrence in the Alps; *Weiss*, [*Zs. Ferd. f. Tirol u. Vorarlberg*, **45**, 129, 1901]; *Zs. Kr.*, **38**, 200. From Campolongo, Tessin; *Mann*, [*Inaug.-Diss.*, Leipzig, 1904]; *Zs. Kr.*, **42**, 666.

**STEENSTRUPINE**, *Min.*, p. 415; *App.*, p. 64. — Crystals from Julianehaab District, Greenland, with anal. by *Christensen*; *Böggild*, *Medd. om Grönl.*, **24**, 23, 1901.

Discussion of chem. comp.; *Zambonini*, *Mem. Acc. Sci. Napoli*, **14**, 64, 1908.

**Stelznerite.** *A. Arzruni* and *K. Thaddeeff*, *Zs. Kr.*, **31**, 232, 1899.

Orthorhombic. Axes  $a : b : c = 0.50368 : 1 : 0.70585$ .

Forms:  $b$  (010),  $c$  (001),  $m$  (110),  $o$  (011),  $p$  (111). Angles:  $mm''' = 53^\circ 28'$ ,  $po = 48^\circ 25\frac{1}{2}'$ .

In prismatic crystals, resembling brochantite, implanted upon a green, crystalline mass.  $G. = 3.884$ . Luster brilliant. Color green. Translucent. Ax. plane  $\parallel c$ , an axes nearly  $\perp m$ .

Composition,  $CuSO_4 \cdot 2Cu(OH)_2$ .

Analyses: 1, *Thaddeeff*; 2, *Schröcker*.

SO <sub>3</sub>	CuO	H <sub>2</sub> O	Fe <sub>2</sub> O <sub>3</sub>	CaO	Gangue.	
1. 22.40	67.08	10.22	0.34	0.06	0.44	= 100.54
2. 22.19	64.01	10.37	1.14	0.57	1.42 H <sub>2</sub> O 0.33	= 100.03

From Remolinos, Vallinar, Chile. Named after Prof. Stelzner.

**STEPHANITE**, *Min.*, pp. 143, 1025, 1048; *App.*, p. 64. — Crystals from *Příbram* with new forms (340), (3.10.0), (140), (160), (087), (031), (833), (553), (11.11.5), (17.17.3), (5.17.9). *Slavík*, [*Abh. böhm. Akad. Prag*, **16**, 1901]; *Zs. Kr.*, **37**, 497. Crystals and twins from *Sarrabus*, Sardinia, with following new forms: (016), (014), (027), (038), (035), (056), (776), (885), (772), (551), (485). (1.3.19), (1.3.17), (1.4.23), (1.4.20), (1.5.30), (3.27.7); *D'Achiardi*, *Att. Soc. Tosc.*, *Mem.* **18**, 1901. Crystals, including some of remarkable size, from *Arispe*, Sonora, Mexico, with anal.; *Ford*, *Am. J. Sc.*, **25**, 244, 1908; *Zs. Kr.*, **45**, 321, 1908.

**Stibio-domeykite.** *G. A. Koenig*, *Am. J. Sc.*, **10**, 445, 1900. — A variety of domeykite from the Mohawk mine, Keweenaw Co., Michigan, peculiar in containing a small amount (1.29 to 0.78 p. c.) of antimony. See *Domeykite*.

STIBIOTANTALITE, App., p. 64. — Crystals from California investigated by Penfield and Ford, Am. J. Sci., **22**, 61, 1906.

Orthorhombic hemimorphic. Axes  $\bar{a} : \bar{b} : \bar{c} = 0.7995 : 1 : 0.8448$ .

Forms:  $a$  (100),  $a'$  ( $\bar{1}00$ ),  $m$  (110),  $g$  (130),  $q'$  ( $\bar{1}30$ ),  $\eta$  (209),  $\eta'$  ( $\bar{2}09$ ),  $h$  (203), probably  $h'$  ( $\bar{2}03$ ),  $\delta$  (043),  $w$  (4.12.9), probably  $w'$  ( $\bar{4}.12.9$ ).

Angles:  $mm''' = 77^\circ 18'$ ,  $gg' = *45^\circ 16'$ ,  $ww' = 34^\circ 38'$ ,  $ww''' = 91^\circ 6'$ ,  $\eta\eta 26^\circ 26'$ ,  $ah = 54^\circ 50'$ ,  $\delta\delta' = 96^\circ 48'$ ,  $gw = *39^\circ 20'$ .

Twinning pl.  $a$  (100) in polysynthetic twins; often only to be observed by pyroelectric tests, which show intimate and repeated twinning. Crystals usually prismatic in habit, showing vertical striations, resembling columbite. Ends of crystals frequently crossed by ridges parallel to  $\bar{b}$  axis, due to twinning. Hemimorphism in direction of  $\bar{a}$  axis.

Cleavage:  $a$  perfect,  $b$  indistinct. H. = 5–5.5. G. = 5.98–7.37, varying with the composition. Luster resinous to adamantine. Color dark brown.

Optically+. Ax. pl.  $\parallel a$ . Bx  $\perp c$ .  $\rho < v$ . Optical constants vary with the variation in composition.

Refractive indices and axial angles:

I. G. = 6.818, corresponding to about 39% Ta<sub>2</sub>O<sub>5</sub> and 17.5% Nb<sub>2</sub>O<sub>5</sub>.

	$\alpha$	$\beta$	$\gamma$	2V	$\gamma - \alpha$
For Li	2.3470	2.3750	2.4275	73° 40'	0.0805
" Na	2.3742	2.4039	2.4568	75° 5'	0.0826
" Tl	2.4014	2.4342	2.3876	77° 38'	0.0862

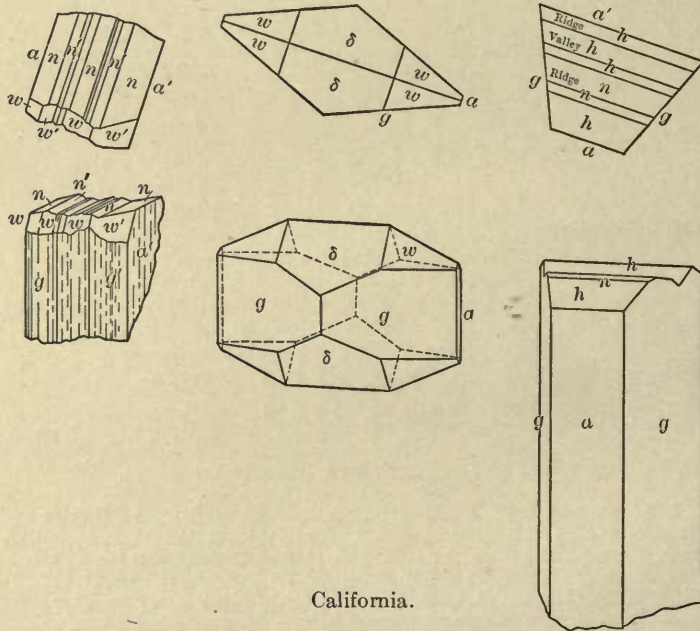
II. G. = 6.299, corresponding to about 22.5% Ta<sub>2</sub>O<sub>5</sub> and 30% Nb<sub>2</sub>O<sub>5</sub>.

	$\alpha$	$\beta$	$\gamma$	2V	$\gamma - \alpha$
For Li	2.3686	2.3876	2.4280	70° 0'	0.0594
" Na	2.3977	2.4190	2.4588	73° 25'	0.0691
" Tl	2.4261	2.4508	2.4903	77° 50'	0.0642

Composition, (SbO)<sub>2</sub>(Ta,Nb)<sub>2</sub>O<sub>6</sub>. Similar to columbite.

Analyses on material from Mesa Grande:

		Ta <sub>2</sub> O <sub>5</sub>	Nb <sub>2</sub> O <sub>5</sub>	Sb <sub>2</sub> O <sub>3</sub>	Bi <sub>2</sub> O <sub>3</sub>
1.	G. = 6.72	36.35	18.98	44.26	0.33 = 99.92
2.	G. = 5.98	11.16	39.14	49.28	0.53 = 100.11



California.

Pry., etc. B. B. fuses at 4, giving a pale bluish flame. Gives coating of oxide of antimony on charcoal. Readily soluble in HF.

Obs. Originally found in tin-bearing sands of Greenbushes, West Australia. Recently found associated with gem tourmaline, pink beryl, feldspar and lepidolite at Mesa Grande, San Diego County, California.

**STIBNITE**, Min., pp. 36, 1048; App., p. 64. — Crystals from Körmöczbánya, Hungary; Moesz, [Földt. Közl., **32**, 39, 1902, 143]; Zs. Kr., **40**, 501. Twin from Japan with twinning plane (310); Cesàro Bull. Ac. Belg., **133**, 1905. Crystals from Honilgoutte, Val de Villé, Alsace, with new forms (380), (180); Ungemach, Bull. Soc. Min., **29**, 264, 1906.

Optical studies; Müller, Jb. Min., Beil., **17**, 187, 1903; Hutchinson, Min. Mag., **14**, 199, 1907; Zs. Kr., **43**, 461.

On its diathermancy; Hutchinson, Min. Mag., **13**, 342.

Occurrence at Cetine di Cortorniano, near Rosia, Siena; Pelloux, Rend. Acc. Linc., **10**, (2), 10, 1901; in magnesite at Eichbergkogel, Semmering, Austria; Redlich, Centralbl. Min., **281**, 1908.

**STILBITE**, Min., p. 583; App., p. 65. — Cryst. — Iceland; Jeremejew, [Bull. Acad. Sc. St. Pétersbourg, **9**, 5, lv-lvi 1898]; Zs. Kr., **32**, 428; Scottish localities; Goodchild, [Trans. Geol. Soc. Glasgow, **12**, Suppl., 1-68, 1903]; Zs. Kr., **45**, 306; East Greenland; Böggild, Medd. om Grönl., **28**, 116, 1905; Petersdorf, near Zóptau, Mähren; Kretschmer, Centralbl. Min., **611**, 1905; Montresta, Sardinia, with anal.; Deprat, Bull. Min. Soc., **31**, 187, 1908.

**Anal.** — Elba with discussion of composition; Manasse, Att. Soc. Tosc., Mem. **17**, 203, 1900; Zs. Kr., **35**, 512; Cala Francese, island Maddalena; Rimatori, Rend. Acc. Linc., **11**, (1), 542, 1902; Crown-prince Rudolf Island; Colomba [Osservazioni sci. spedizione polare, Duca Abruzzi, Milano, 1903]; Zs. Kr., **41**, 279; Moore Station, N. J.; Eyerman, Amer. Geol., **34**, 40, 1904; Zs. Kr., **42**, 302; Kilbarchan, Renfrewshire; Houston, [Trans. Geol. Soc. Glasgow, **12**, 354-361, 1906]; Zs. Kr., **45**, 304; chem. constitution; McNeil, Jour. Amer. Chem. Soc., **28**, 598, 1906; San Piero in Campo, Elba; D'Achiardi, Proc. Soc. Tosc. Sc. Nat., May, 1904; Att. Soc. Tosc. Sc. Nat., **22**, 150-165, 1906; Jamberoo, N. S. W.; Anderson, Proc. Aus. Mus., **6**, 422, 1907; Nadap, Hungary; Mauritz, Ann. Mus. Nat., Hung., **553**, 1908; Teigarhorn, Iceland, with discussion of composition; Baschieri, Att. Soc. Tosc., **24**, 1908; discussion of chem. comp.; Zambonini, Mem. Acc. Sci., Napoli, **14**, 112, 1908.

In granite from Montorfano, Northern Italy; Tacconi, Rend. Acc. Linc., **14**, (2), 88, 1905; from Montresta, Sardinia; Millosevich, *ibid.*, **17**, (1), 269, 1908.

**Stilpnochloran.** *F. Kretschmer*, Centralbl. Min., 203, 1905; *ibid.*, 292, 1907.

In scales usually in parallel arrangement; at times radial. Cleavage perfect. Yellow to bronzed color. Yellow streak. Greasy luster on cleavage face. Soapy feel.  $H. = 2-3$ .  $G. = 1.813-1.827$ .

Comp.,  $H_{24}(Al,Fe)_{10}(Ca,Mg)Si_9O_{46}$ . Analysis:

SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	MnO	CaO	MgO	P <sub>2</sub> O <sub>5</sub>	H <sub>2</sub> O
33.30	4.37	44.33	0.34	1.22	1.73	0.37	14.10 = 99.76

**Pyr.** B. B. fuses with difficulty to black enamel. C. T. gives water and blackens. Decomposed by HCl.

**Occ.** As alteration product of *thuringite* at iron ore mines at Gobitschau, near Sternberg, Mähren.

**Alter.** Alters to chloropal.

**Name** derived from *σπιπνός*, shining, and *χλωρός*, yellow.

**STILPNOMELANE**, Min., p. 658; App., p. 65. — Analysis of *chalcodite* from Harzburg in Radautal; Fromme [Jahrber. d. Ver. f. Natw. Braunsch., **12**, 31, 1900], Zs. Kr., **36**, 656.

**Stoffertite.** *C. Klein*, Ber. Ak. Berlin, June 13, 1901.

A name provisionally given to a mineral similar to brushite but containing a little more water. Monoclinic. Crystals show *b* (010) and *n* (011), which agree in their measured angles with the similar forms found on brushite. Cleavage  $\parallel b$ , perfect. Color faint yellow. Axial pl.  $\perp b$ .  $Bx \perp b$ . Extinction on *b* inclined to *b* axis in small angle  $\beta$  for Li  $9^\circ 15'$ , Na  $10^\circ 15'$ , Tl  $11^\circ 15'$ . Extinction direction lying in obtuse angle =  $a$ , in the acute angle =  $b$ , and  $\parallel b$  axis =  $c$ . Indices of refraction:  $\alpha = 1.5509$ ,  $\beta = 1.5455$ ,  $\gamma = 1.5392$ ,  $2V = 85^\circ 16'$ .

Comp.,  $2CaO \cdot P_2O_5 \cdot 6\frac{1}{2}H_2O = CaO, 30.18; P_2O_5, 38.28; H_2O, 31.54$ .

Analysis by Finkener:

	CaO	P <sub>2</sub> O <sub>5</sub>	SO <sub>4</sub>	H <sub>2</sub> O
1.	30.83	37.96	0.49	30.88 = 100.16
2.*	30.69	38.22		31.09 = 100.00

\* After subtracting sufficient amount of anhydrite molecule to account for SO<sub>4</sub>. Found in the guano deposits on the island of Mona in the West Indies. Named in honor of Dr. Stoffert, who collected the specimens.

**Stokesite.** *A. Hutchinson*, *Phil. Mag.*, **48**, 480, 1899; *Min. Mag.*, **12**, 274, 1900.

Orthorhombic. Axes:  $\tilde{a} : \tilde{b} : \tilde{c} = 0.3462 : 1 : 0.8037$ ;  $(100) \wedge (110) = 19^\circ 5\frac{1}{2}'$ ,  $(001) \wedge (011) = 38^\circ 47\frac{1}{2}'$ ,  $(001) \wedge (101) = 66^\circ 41\frac{1}{2}'$ .

Observed forms:  $b$  (010),  $c$  (001),  $m$  (110) cleavage,  $s$  (565),  $t$  (122),  $v$  (121). Angles  $bv = *57^\circ 33'$ ,  $vv''' = 64^\circ 54'$ ,  $vv' = 101^\circ 37'$ ,  $vv'' = *141^\circ 0'$ . Known only in a single crystal of acute pyramidal habit ( $v$ ) with  $b$  prominent.

Cleavage  $m$  perfect;  $b$  less so. Fracture conchoidal. Brittle.  $H. = 6$ .  $G. = 3.185$ . Luster vitreous, pearly on  $b$ . Colorless, transparent.

Ax. pl.  $\parallel b$ .  $Bx_a \perp c$ .  $2V_{Na} = 69\frac{1}{2}^\circ$ .  $\beta = 1.6125$ ,  $\gamma - \alpha = 0.01$ .

Composition, perhaps,  $H_2CaSnSi_2O_{11}$  or  $CaO.SnO_2.3SiO_2.2H_2O$ . The most probable results of analysis on a minute quantity gave Hutchinson (l. c.)  $SiO_2$ , 43.1;  $SnO_2$ , 33.3;  $CaO$ , 13.45;  $H_2O$ , 8.6 = 98.45.

Associated with axinite from Roscommon Cliff, St. Just, Cornwall; known only in a single specimen in the Cambridge Museum.

Named after Sir George G. Stokes, Professor of Mathematics at Cambridge.

STOLPENITE, *Min.*, p. 690, see *Montmorillonite*.

STOLZITE, *Min.*, p. 989; *App.*, p. 65. — Crystals from Bena e Padru, Ozieri, Sardinia, with following new forms: (113), (115), (117), (119), (233), (344)?, (455)?, (899)?; Artni, *Rend. Ist. Lomb. Milano*, **38**, 373, 1905; see also Lovisato, *Rend. Acc. Linc.*, **13**, (2), 43, 1904.

Occurrence with anal. from Marianna de Itacolomy, Minas Geraes, Brazil; Florence, *Centralbl. Min.*, 725, 1903.

STRONTIANITE, *Min.*, pp. 285, 1048; *App.*, p. 65. — Crystals from Westphalia (Münsterland), described with new forms, also optical constants determined; Beykirch, *Jb. Min., Beil.* **13**, 389, 1901.

Occurrence (with anal.) at Lubna near Rakonitz, Bohemia; Eiehleiter [Verh. geol. Reichsanst. Wien, 297, 1898]; *Zs. Kr.*, **33**, 649. Anal. of material from Kunětzer mountain near Pardubice, Bohemia; Kovář, [*Zs. chem. Industrie*, **10**, 1900]; *Zs. Kr.*, **36**, 204.

**Strüverite.** *F. Zambonini*, [*R. Acc. Sc. Napoli*, **13**, 35, 1907]; *G. T. Prior* and *F. Zambonini*, *Min. Mag.*, **15**, 78, 1908.

Tetragonal.  $\tilde{c} = 0.6456$ .  $(111) : (\bar{1}11) = 56^\circ 57'$ . Forms:  $a$  (100),  $b$  (010),  $m$  (110),  $s$  (111). Crystals small. Color iron-black. Streak gray-black.  $H. = 6$ .  $G. = 5.54-5.59$ . Infus.

Comp. perhaps  $FeO.(Ta,Nb)_2O_5.4TiO_2$ ;  $TiO_2$ , 44.03;  $Ta_2O_5$ , 23.03;  $Nb_2O_5$ , 23.03;  $FeO$ , 9.91. Analysis (Prior):

$TiO_2$	$\frac{Nb_2O_5.Ta_2O_5}{47.96^*}$	$FeO$	$CaO$	$MgO$
41.20		11.38	0.51	0.17 = 100.22

\* In nearly equal amounts of  $Nb_2O_5$  and  $Ta_2O_5$ .

Represents the  $Ta_2O_5$ -rich end of a series of which *ilmenorutile* is the  $Nb_2O_5$ -rich end. See under *ilmenorutile*.

Oec. In pegmatite veins in the neighborhood of Craveggia, Val Vigesso, northern Piedmont. Named after Prof. G. Strüver.

STRUVITE, *Min.*, p. 806. — From Limfjord with optical study; Böggild, *Medd. Dansk. geol. For.*, **13**, 25, 1907.

Occurrence with newberyite, which see.

Artif. formation; Richter, *Min. Mitth.*, **20**, 89, 1901.

STYLOTYPITE, *Min.*, p. 130. — Crystals from the mine "Candalosa Costrovirroyna," Peru, examined by S. Stevanović, *Zs. Kr.*, **37**, 235, 1902. Habit prismatic.

Axes  $\tilde{a} : \tilde{b} : \tilde{c} = 1.9202 : 1 : 1.0355$ ,  $\beta = 90^\circ$  approx.

Forms:  $a$  (100),  $\mu$  (310),  $n$  (210),  $m$  (110),  $r$  (101),  $t$  (302),  $s$  (401),  $d$  (032),  $x$  (111),  $y$  (332),  $q$  (313),  $o$  (311); angles  $cm = *43^\circ 50'$ ,  $\mu o = *27^\circ 40'$ .

Analyses (from 2, 10.84 p. c.  $Cu Fe S_2$  has been deducted):

		S	Sb	As	Bi	Cu	Ag	Fe	Zn
1. Copiapo	G. = 5.18	23.12	28.58	...	...	30.87	10.43	6.27	tr. = 99.27
2. Candalos	G. = 4.77	24.55	18.99	7.07	0.54	45.84	1.62	...	0.90 = 99.51

The essential identity of falkenhaynite (*Min.*, p. 1034) with stylotypite is remarked upon.

SUCCINITE, *Min.*, p. 1002. — Index of refraction: Dahms, *Schrift. Naturfors. Ges.*, Danzig, **11**, 4, 25, 1906; constitution; id., *ibid.*, **10**, 243, 1901.



**SULPHOBORITE**, App., p. 65. — Occurs with anhydrite and boracite in carnallite at the potash mines near Wittmar on the Asse, Brunswick; Bücking, *Zs. Kr.*, **36**, 156, 1902.

**SULPHOHALITE**, Min., p. 917; App., p. 65. — Analysis by Penfield, Am. J. Sc., **9**, 425, 1900, which follows, gives formula as  $2\text{Na}_2\text{SO}_4 \cdot \text{NaCl} \cdot \text{NaF}$ , with theoretical comp.,  $\text{SO}_3$ , 41.61;  $\text{Na}_2\text{O}$ , 32.25; Na, 11.97; Cl, 9.23; F, 4.94.

$\text{SO}_3$	$\text{Na}_2\text{O}$	$\text{K}_2\text{O}$	Na	Cl	F	Ign.
41.79	32.37	0.10	11.60	9.10	4.71	0.15 = 99.82

**SULPHUR**, Min., pp. 8, 1048; App., p. 66. — Discussion of crystallization from fusion with regard to the various crystalline conditions assumed. Brauns, *Jb. Min., Beil.-Bd.*, **13**, 39, 1899. Crystals from Corphalie, Belgium, with following new forms: (201), (102), (043), (227), (229)?, (115), (3.3.16), (116); Buttgenbach, *Ann. soc. géol. Belg.*, **25**, 73, 1898; from Girgenti, twins with  $e$  (101) and  $n$  (011) as twinning planes; Busz, *Jb. Min.*, **2**, 132, 1901; from marble of Carrara; D'Achiardi, *Att. Soc. Tosc. Sc., Mem.* **20**, 1905; from Bruchsal, Baden; Beierle, *Centralbl. Min.*, **202**, 1906; from near Lornano, Siena; Manasse, *Att. Soc. Tosc.*, **23**, 1907.

Study of the different polymorphous crystalline forms of sulphur; Gaubert, *Bull. Soc. Min.*, **28**, 157, 1905.

Concerning microstructure of frozen sulphur; concerning sublimation, superheating and supersaturating of sulphur. Bütschli, *sep. pub.*; *Zs. Kr.*, **36**, 534.

Occ. at Cetine di Cortorniano, near Rosia, Siena; Pelloux, *Rend. Acc. Linc.*, **10**, (2), 10, 1901; with celestite, Maybee, Michigan; Kraus and Hunt, *Am. J. Sc.*, **21**, 237. Crystals formed at eruption of Vesuvius, 1906, see under Vesuvius.

Specimens of Quaternary clay, from Ortala Lund, Väddö parish, Sweden, which were originally black in color have gradually had developed through the mass and on the surface well-formed crystals (hemihedral in habit) of sulphur, the latter 3 to 3.5 mm. in diameter. E. Erdmann, *G. För. Förh.*, **23**, 379, 1901.

*Arsensulphurite* is an arsenical sulphur ("sulfurite") occurring in thin brownish-red amorphous crusts on andesite at the volcano of Papandajan in Java; Rinne, *Centralbl. Min.*, **499**, 1902. An analysis by Buchholz gave: S, 70.78; As, 29.22 = 100. A similar occurrence was earlier noted by Phipson at the Solfatara near Naples (S, 87.6; As, 11.2; Sc, 0.3 = 99.1), *C. R.*, **55**, 108, 1852.

**Sulvanite**. G. A. Goyder, *Jour. Chem. Soc.*, **77**, 1094, 1900.

Massive. H. = 3.5. G. = 4.0. Luster metallic. Color bronze yellow. Streak nearly black. Comp.,  $3\text{Cu}_2\text{S} \cdot \text{V}_2\text{S}_5$  = Cu, 51.50; V, 13.88; S, 34.62.

Analyses:

	Cu	V	S	$\text{Fe}_2\text{O}_3$	$\text{SiO}_2$
1.	47.98	12.53	32.54	0.42	4.97 = 98.44
1 (recalc.)	51.57	13.46	34.97	....	.... = 100.00
2.	48.98	12.68	30.80	1.53	5.72 = 99.71
2 (recalc.)	52.96	13.72	33.32	....	.... = 100.00

Obs. — Found in a mine near the Burra, South Australia, associated with malachite, azurite, quartz, vanadium ocher, gypsum and calcite.

**SVANBERGITE**, Min., p. 868. — Chemical constitution, see under *Hamlinite*.

**SYCHNODYMITE**, Min., p. 1049. — Occurrence from Sieghal, Germany, with anal.; Stahl, *Berg- u. Hütten. Ztg.*, **58**, 182, 1899; *Zs. Kr.*, **35**, 289.

**SYLVANITE**, Min., p. 103; App., p. 66. — Crystals from Cripple Creek, Colo., show following new forms:  $v$  (525),  $w$  (343),  $j$  (521),  $u$  (723). Anal. given, Palache, *Am. J. Sc.*, **10**, 419, 1900; *Zs. Kr.*, **34**, 539; also  $H$  (102),  $T$  (103),  $l$  (203),  $L$  (203); Moses, *Am. J. Sc.*, **20**, 282, 1905. Crystals from Nagyág with new forms  $E$  (102),  $G$  (302),  $T$  (312),  $\eta$  (523),  $\epsilon$  (543),  $L$  (320),  $U$  (610); Vrba [*Ber. aus Ungarn.*, **47**, 1–5, 1904], [*Föld. Közl.*, **34**, 311, 1904]; *Zs. Kr.*, **44**, 69.

Analysis, Cripple Creek, Colo.; R. Pearce [*Proc. Colo. Sc. Soc.*, **5**, 11, 1894]; *Zs. Kr.*, **31**, 291:

Te	Au	Ag
60.61	25.45	13.94 = 100

Discussion of chemistry of natural tellurides of gold; Lenher, *Jour. Amer. Chem. Soc.*, **24**, 355, 1902.

Occurs at Kalgoorlie in the East Coolgardie gold district, West Australia, much less abundant than calaverite, cf. Spencer, *Min. Mag.*, **13**, 271, 1903; Carnot, *Bull. Soc. Min.*, **24**, 360, 1901 (anal.); *C. R.*, **132**, 1299, 1901; also (with anal.) Krusch, *Centralbl. Min.*, **199**, 1901; *Zs. prakt. Geol.*, **9**, 211, 1901; *Zs. Kr.*, **38**, 302.

**SYLVITE**, Min., pp. 156, 1036, 1049; App., p. 66. — Hemihedrism; Mügge, Centralbl. Min., 259, 1906.

Sp. G.; Przibylla, Centralbl. Min., 234, 1904.

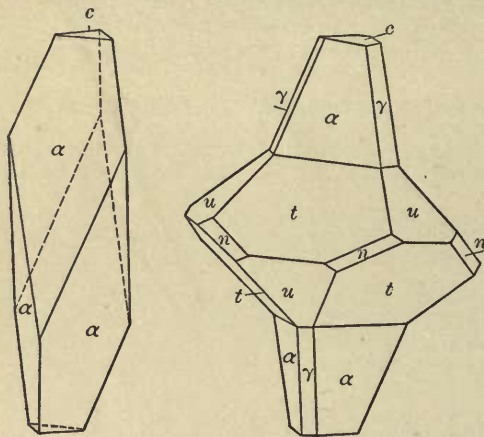
Deformation under pressure; Rinne, Jb. Min., 1, 114, 1904.

Occurrence in lavas of 1906 from Vesuvius; Lacroix, C. R., 142, 1249, 1906; Bull. Soc. Min., 30, 239, 1907.

A supposed mixture of KCl and NaCl in mineral found in ejected material from Vesuvius (eruption of April, 1906) and named "*chlornatrokalite*" is proven to be an intimate mixture of the two minerals, halite and sylvite; Johnston-Lavis, Nature, 74, 174, 1906; Johnston-Lavis and Spencer, Min. Mag., 15, 59.

See *Chlormanganokalite*.

**Synchisite**. *G. Flink*, Bull. G. Inst. Upsala, 5, 81, 1901; Medd. om Grönland, 24, 29, 1901. Parisite, *G. Nordenskiöld*, G. För. Förh., 16, 338, 1894. *Böggild*, Medd. om Grönland, 33, 99, 1906.



Synchisite.

Composition,  $\text{CeFCaC}_2\text{O}_6$ . Analyses: 1, *Flink* also approx. anal. by *Nordenskiöld*, l. c.

	$\text{CO}_2$	$\text{ThO}_2$	$\text{Ce}_2\text{O}_3$	$(\text{La}, \text{Di})_2\text{O}_3$	$\text{Y}_2\text{O}_3$	$\text{CaO}$	$\text{FeO}$	$\text{Na}_2\text{O}$	$\text{K}_2\text{O}$	$\text{F}$	$\text{H}_2\text{O}$
1.	26.54	...	23.14	22.88	1.23	17.13	...	0.19	0.12	5.82	...
2.	25.99	0.30	21.98	28.67*	1.18†	16.63	0.11‡	...	...	5.04	2.10§ = 102.00 (O = F, 2.12)

\* Perhaps one-half La, also Di with Prd and Sm. † Earths not precipitated by  $\text{K}_2\text{SO}_4$ . ‡ Or  $\text{Fe}_2\text{O}_3$  with Ti tr. § Undried material analyzed, 1.56  $\text{H}_2\text{O}$  expelled at  $100^\circ$ .

B. B. infusible, but glows brilliantly when ignited. Easily dissolved by acids with loss of  $\text{CO}_2$ . From Narsarsuk, So. Greenland; occurs on surfaces of feldspar or aggrite or in cavities. First described by *G. Nordenskiöld* as parisite, to which it is closely related.

Named *σύγχυσις*, confounded, in allusion to its being mistaken for parisite.

**SYNGENITE**, Min., p. 945; App., p. 66. — Refractive indices; Gaubert, Bull. Soc. Min., 30, 107, 1907.

Conditions of formation discussed; van't Hoff with Wilson, Farup, d'Ans, Ber. Ak. Berlin, 1142, 1900; 1000, 1903; 218, 1906.

**Szechenyiite**. *J. Krenner*, Zs. Kr., 31, 503, 1899. — A variety of amphibole, which see.

**TACHYDRITE**, Min., p. 178; App., p. 66. — Discussion of conditions of formation; van't Hoff with Dawson, Lichtenstein, d'Ans, Farup; Ber. Ak. Berlin, 557, 1899; 232, 913, 1905; 218, 1906.

**Tæniolite**. *Tainiolite*. *G. Flink*, Medd. om Grönland, 14, 234, 1898; 24, 115, 1901.

Monoclinic, and belonging to the mica group. Forms:  $b$  (010),  $c$  (001),  $\theta$  (027),  $e$  (023),  $\mu$  ( $\bar{1}11$ ), referred to the axial ratio of biotite. Crystals thin strips, elongated  $\parallel a$ , maximum length 5 mm. Measured angles:  $ce = 24^\circ 44'$ ,  $c\mu = 81^\circ 28'$ ,  $\mu\mu' = 60^\circ 15'$ . Twins rare, two crystals in contact crossing at  $60^\circ$ .

Cleavage  $c$  perfect, as in muscovite; laminae somewhat elastic.  $H. = 2.5-3$ .  $G. = 2.86$  (Mauzelius). Color, colorless, with tinge of blue. Transparent. Ax. pl.  $\parallel b$ .  $Bx_a$  inclined  $+5^\circ$  to  $\hat{c}$ .  $2E = 50^\circ$  approx. Birefringence negative, not strong.

Composition, somewhat uncertain; if the loss showed by the analysis (on 0.1 gr.) is calculated as  $H_2O$ , the formula obtained is  $(K,Li)_2O.MgO.3SiO_2.2H_2O$ ; fluorine may also be present. Analysis, Mauzelius:

$SiO_2$	$Al_2O_3$	FeO	MgO	$K_2O$	$Na_2O$	$Li_2O$	Loss
52.2	2.7	0.6	19.1	11.5	1.8	3.8	[8.3] * = 100

\* Author gives 8.7 per cent.

B. B. fuses easily to a colorless blebby glass, coloring the flame intensely red. Completely but slowly decomposed by hydrochloric acid.

Occurs very sparingly at Narsarsuk, Southern Greenland, in druses with feldspar and ægirite; narsarsukite and graphite are also closely associated.

Named from *raulia*, band or strip, and *lithos*, stone, in allusion to the form of the crystals.

TAENITE, Min., pp. 29, 1037. — Occurrence in meteoric iron found in 1884 in the sub-district of Youdegin, W. Australia; Fletcher, Min. Mag., 12, 171.

TALC, Min., p. 678; App., p. 66. — Analyses of steatite from various localities; Merrill, Non-metallic Minerals. Rep. U. S. Nat. Mus., 1899; Zs. Kr., 36, 73; from North Carolina; Pratt, N. C. Geol. Sur. Economic Papers, 3, 1900; Zs. Kr., 36, 81. Iron-bearing *pyralloite* with anal. from Lake Brocan, Valle del Gesso di Entraque, Piedmont; Roccati, [Boll. Soc. geol. ital., 24, 659, 1905]; Zs. Kr., 43, 500; from Kossoi-Brod, Ural Mts.; Iwanoff, [Bull. Nat. Moscow, 1906, p. 156]; Zs. Kr., 46, 221; chemical constitution, McNeil, Jour. Amer. Chem. Soc., 28, 591, 1906.

Occ. in porphyry near Niemberg, Saxony; Haas, Zs. für Naturwiss., Halle, 76, 431, 1903.

**Tamanite.** S. P. Popoff, Zs. Kr., 37, 267, 1902. — Same as *anapaïte*, which see.

TAMARUGITE, Min., p. 952. — Anal. of material from Zolfo Grotto, Miseno, Italy; Zambonini, Rend. Acc. Sci. Napoli, Dec., 1907.

TANTALITE, Min., p. 731; App., p. 67. — Occurrence at Wodgina, W. Australia, with anal.; Maitland, Bull. Geol. Sur. W. Aus., No. 23, 65-74, 1906; occurrence of tantalum and niobium minerals in Australia; Simpson, Trans. Aus. Ass. Adv. Sci., Jan., 1907.

**Taramellite.** E. Tacconi, Centralbl. Min., 506, 1908; Rend. Acc. Linc., 17, (1), 810, 1908.

Orthorhombic (?). Fibrous in bundles and radiating aggregates. Color reddish brown. Luster vitreous to silky. H. = 5.5. G. = 3.92. Cleavage perfect parallel to length of fibers, parting perpendicular to cleavage. High birefringence. Positive. Ax. pl. parallel to length of fibers and at right angles to cleavage. Obtuse bisectrix  $\perp$  to cleavage plane.  $2E_a = 74^\circ$  (approx.). Strong pleochroism, c almost black, b and a flesh red.

Comp.:  $Ba_4Fe^{II}Fe^{III}Si_{10}O_{31}$ ;  $SiO_2$ , 37.53;  $Fe_2O_3$ , 19.88; FeO, 4.47; BaO, 38.12.

Anal.:  $SiO_2$ , 36.56;  $Fe_2O_3$ , 21.54; FeO, 4.47; BaO, 37.32 = 99.89.\*

\* Traces of  $TiO_2$ ,  $Al_2O_3$ , MnO and MgO not determined.

Occ. Found in granular limestone at Candoglia near the contact with a gneiss. Associated with calcite, magnetite, chalcopyrite, pyrite, diopside, actinolite, celsian. Diopside and actinolite altered to ægirine and arfvedsonite.

Named in honor of the geologist Prof. Torquato Taramelli.

**Tarbuttite.** L. J. Spencer, Nature, 76, 215, 1907; Min. Mag., 15, 22, 1908.

Triclinic.  $\tilde{a} : \tilde{b} : \tilde{c} = 0.9583 : 1 : 1.3204$ ;  $\alpha = 102^\circ 37'$ ,  $\beta = 123^\circ 52'$ ,  $\gamma = 87^\circ 25'$ . Angles: (100) : (001) =  $55^\circ 50'$ ; (001) : (101) =  $77^\circ 38'$ ; (100) : (010) =  $84^\circ 34'$ ; (001) : (010) =  $76^\circ 31'$ ; (001) : (223) =  $72^\circ 3'$ . Forms (arranged according to size and frequency of occurrence): c (001), b (010), a (100), e ( $\bar{2}21$ ), f (101), g (211), d (223), k ( $\bar{1}\bar{1}1$ ), l (021), h (021), i (122), r (243), o (121), s (102), t (103), u (011), m (110). Crystals striated and rounded, frequently in sheaf-like aggregates. Cleavage c (001), perfect with pearly luster on cleavage face. H. =  $3\frac{1}{2}$ . G. = 4.12-4.15. Luster vitreous. Sometimes colorless and transparent; usually pale shades of yellow, brown, red or green. Acute neg. bisectrix emerges obliquely through cleavage c (001). Double refraction strong. Ax. angle in air  $80^\circ$ - $90^\circ$ .

Comp., Basic zinc phosphate,  $Zn_3P_2O_8.Zn(OH)_2$ ; ZnO, 67.1;  $P_2O_5$ , 29.2;  $H_2O$ , 3.7.

Analysis:	ZnO	$P_2O_5$	$H_2O$
	66.6	29.2	3.8 = 99.6

Pyr. In C. T. at high temperature decrepitates slightly and gives small amount of water. B. B. readily fusible to clear, yellow bead which becomes dark gray on cooling. Easily soluble in HCl.

Pseudomorphs after smithsonite, deseloizite and calamine (?) observed. Found at the zinc mines of Broken Hill, N. W. Rhodesia. Named after Mr. Percy Coventry Tarbutt.

**Teallite.** *G. T. Prior*, *Min. Mag.*, **14**, 21, 1904.

Orthorhombic? Forms: *c* (001), *o* (111), *p* (221), also doubtful *a* (100), *d* (101), *e* (201), *t* (211). Measured angles:  $co = 62\frac{1}{2}^\circ$ ,  $cp = 75^\circ$ ,  $cd = 57^\circ$ , zone (*co*)  $\wedge$  (*co'''*) =  $86^\circ$ . In thin flexible folia. Cleavage, *c* perfect. *H.* = 1-2. *G.* = 6.36. Luster metallic. Color blackish gray. Streak black. Opaque.

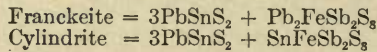
Composition,  $PbSnS_2$  or  $PbS.SnS_2$ . Analysis:

$\frac{2}{3}$  S, 16.29; Sn, 30.39; Pb, 52.98; Fe, 0.20 = 99.86

Yields a little sulphur in the closed tube, but does not fuse; readily decomposed by hot hydrochloric or nitric acid.

Occurs in thin folia, resembling graphite, embedded in kaolin, upon a dark-gray matrix impregnated with pyrite; also associated with wurtzite and with galena. Brought by Theodor Hohmann from South America, exact locality unknown but probably from Bolivia. Stated by Koechlin, *Min. Mitth.*, **24**, 114, 1905, to have come from Santa Rosa, Antequera, Bolivia.

From analyses by *Prior* (loc. cit.) of franckeite and cylindrite the following formulæ, showing their relationships to each other and to teallite, were derived.



**TELLURITE**, *Min.*, pp. 201, 1049. — Anal. from Good Hope mine, Gunnison Co., Colo.; *Headden*, [*Proc. Col. Sci. Soc.*, **7**, 141, 1903]; *Zs. Kr.*, **41**, 203.

**TELLURIUM**, *Min.*, pp. 11, 1049. — Crystals from Babia, Asia Minor; *Cesàro*, *Bull. Ac. Belg.*, **255**, 1908.

Analyses, Gunnison and Boulder counties, Colo.; *Headden*, *Proc. Col. Sci. Soc.*, **7**, 139, 1903.

From W. Australia; *MacIvor*, *Chem. News*, **82**, 272, 1900. Occurs in masses three inches across with pyrite, petzite and rickardite ( $Cu_4Te_3$ ) at the Good Hope mine at Vulcan, Colorado.

**TELLURWISMUTH**, see under *Bismuthinite*.

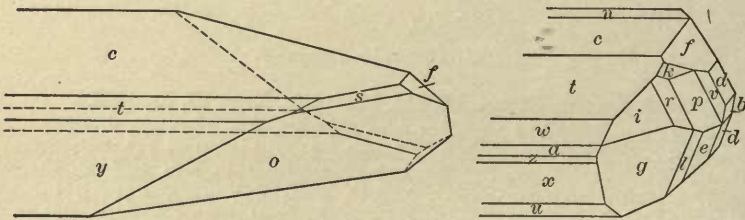
**TENGERITE**, *Min.*, p. 306. — Possible occurrence with gadolinite at Barringer Hill, Llano Co., Texas. Anal. by *Hillebrand* shows beryllium carbonate. *Hidden*, *Am. J. Sc.*, **19**, 429, 1905.

**TENNANTITE**, *Min.*, pp. 137, 1049; *App.*, p. 67. — Binnite identical with; see *Binnite*.

**TEPHROITE**, *Min.*, p. 457. — Anal. of material from Bendemeer, N. S. W.; *Mingaye*, *White and Greig*, [*Rec. Geol. Sur. N. S. W.*, **8**, 182, 1905]; *Zs. Kr.*, **43**, 623.

**Terlinguaite.** *A. J. Moses*, *Am. J. Sc.*, **16**, 255, 1903. *Hillebrand* and *Schaller*, *ibid.*, **24**, 270, 1907.

Monoclinic. Axes  $a : b : c = 0.5306 : 1 : 2.0335$ . *Schaller* gives 1.6050 : 1 : 2.0245.  $\beta = 74^\circ 16'$ ;  $74^\circ 23'$  (*Schaller*). Forms: 133 forms observed. *Schaller* (priv. contr.) proposes a slightly changed position to the faces, h. k. l. (*Moses*) becoming 3 h. k. l. (*Schaller*).



Terlinguaite.

In small prismatic crystals elongated  $\parallel b$  and striated in this direction, rarely doubly terminated. Brittle to subsectile. Cleavage perfect  $\parallel (101)$ . *H.* = 2-3. *G.* = 8.725. Luster brilliant adamantine. Color sulphur-yellow with slight greenish tinge, of powder lemon-yellow, both becoming olive-green on exposure. Birefringent. Extinction parallel.

Composition, an oxychloride of mercury,  $Hg_2ClO$ ; *Hg*, 88.65; *Cl*, 7.85; *O*, 3.50.

Analyses I, *J. S. McCord*; II, *Hillebrand*.

	Cl	O	Hg
I. ( $\frac{2}{3}$ )	7.89	3.47	( $\frac{2}{3}$ ) 88.24 = 99.60
II.	7.83	3.75	88.61 = 100.19

Occurs with eglestonite at the mercury locality at Terlingua, Texas. The name was first used by W. H. Turner (Mining and Scientific Press, July 21, 1900), but the species was established by Moses; it has also been applied by the local miners to a yellow pulverulent material.

**Termierite.** *G. Friedel*, Bull. Soc. Min., **24**, 7, 1901.

A clay-like substance resembling halloysite. After exposure to the air for some hours it appears in small compact masses with conchoidal fracture and zonal structure; color clear gray, opaque.

H. = 2 approx. G. = 1.21. In thin sections shows birefringence (= 0.002), perhaps due to original tension.

Adheres strongly to the tongue, but has no argillaceous odor. Absorbs water in large quantity when placed in it, but does not become plastic; when saturated with water the color deepens and the edges become translucent; refractive index then 1.403 and G. = 1.549.

Composition, a hydrated aluminium silicate, corresponding to  $\text{Al}_2\text{O}_3 \cdot 6\text{SiO}_2 \cdot 18\text{H}_2\text{O}$  when saturated with water.

Analysis of pure material gave, after ignition:

$\text{SiO}_2$	$\text{Al}_2\text{O}_3$	$\text{Fe}_2\text{O}_3(\text{FeO})$	CaO	MgO
78.29	15.00	4.85	1.77	0.47 = 100.38

Water to the amount of 6.77 ( $\frac{3}{4}$ ) is lost between  $110^\circ$  and the temperature of ignition. Attacked with difficulty by cold hydrochloric acid. Fuses B. B. with difficulty.

Occurs with kaolinite, lassallite (q. v.) and barite in sterile levels of the antimony mines of Miramont, France, in the concession of Souliac on the borders of Cantal and Haute Loire.

Named after Professor Pierre Termier of Paris.

TETRADYMITITE, Min., p. 39; App., p. 67. — See *Bismuthinite*.

**TETRAHEDRITE**, Min., p. 137; App., p. 67. — **Cryst.** — From Pulacayo mine, Huanchaca, Bolivia; Spencer, Min. Mag., **12**, 325, 1900; Botes-Berge, Hungary, with new form II (655); Zimányi, Zs. Kr., **34**, 78, 1900; anal. of material; Loetzka, *ibid.*, **84**; from marble of Carrara; D'Achiardi, Att. Soc. Tosc. Sc., Mem. **21**, 1905; Traversella; Colombia, Rend. Acc. Linc., **15**, 643, 1906. Val de Villé, Alsace (with anal.); Ungemach, Bull. Soc. Min., **29**, 219, 1906.

Crystals with anal. from Oisans, Dauphiné; from Horhausen, Rhenish Prussia; from Wolfach, Baden, with discussion of many analyses and the proposal of a new formula, namely  $3\text{R}'_2\text{S}_2\text{R}''_2\text{S}_2 + x[6\text{R}'''\text{S}_2\text{R}''_2\text{S}_2]$ , where  $\text{R}' = \text{Cu, Ag}$ ;  $\text{R}'' = \text{Fe, Zn}$ ;  $\text{R}''' = \text{Sb, As, Bi}$ ; and  $x$  is a small fraction often =  $\frac{1}{10}$  and  $\frac{1}{2}$ , but rising to  $\frac{1}{2}$  in the case of the highly ferriferous tetrahedrite, "*coppite*." Prior and Spencer, Min. Mag., **12**, 184, 1899.

**Anal.** — Campiglia Soana, Ivrea, Piedmont; Novarese, Boll. Com. Geol. Ital., **23**, 319, 1902; [Rassegna Min., **18**, 17, 18, 1903]; Zs. Kr., **40**, 293; Palmavexi, Sardinia; Rimatori, Rend. Acc. Linc., **12**, (2), 471, 1903; Boccheggiano, Fannulla valley, Italy; Taconi, Rend. Acc. Linc., **13**, (1), 337, 1904; var. *frigidite* from Frigido, near Massa, Italy; Manasse, Att. Soc. Tosc., **22**, 81–93, 1906.

Concerning its regular intergrowth with galena; Zimányi, Zs. Kr., **38**, 495.

Occurrence at Cobalt, Ont.; Miller, Rep. Can. Bureau Mines, 1905, **2**; Zs. Kr., **43**, 395.

**THALÉNITE**, App., p. 68. — Hillebrand, Am. J. Sc., **13**, 145, 1902, shows that formula given by Benedicks is not borne out by his analyses.

Occurrence (with anal.) at Åskagen in Värmland, Sweden; Sjögren, G. För. Förh., **28**, 93, 1906.

**THAUMASITE**, Min., p. 698; App., p. 68. — Loss of water on heating and discussion of chem. comp.; Zambonini, Mem. Acc. Sci. Napoli, **14**, 11, 1908.

**THELLITE** (*thelline*). Name given to Damour's silicate from Brazil, Chem. News, **21**, 13, 1870; see Min., p. 512.

**THENARDITE**, Min., p. 895; App., p. 68. — Occurrence at Itivdlik-Dal, Holstensborg district, Greenland, with anal.; Pjetursson, [Medd. om Grönl., **14**, 337, 1898], Min. Grönl., 1905. Occurrence of sodium sulphate, etc., in fumaroles of Mt. Pelée, Martinique; Lacroix, Bull. Soc. Min., **28**, 60, 1905; anal. of material from Natroun lakes, Egypt; Couyat, *ibid.*, **31**, 343, 1908.

**THOMSONITE**, Min., pp. 607, 1050; App., p. 68. — **Cryst.** — Scottish localities; Goodchild, [Trans. Geol. Soc., Glasgow, **12**, Suppl., 1–68, 1903]; Zs. Kr., **45**, 307; Petersdorf near Zöptau, Mähren; Kretschmer, Centralbl. Min., 613, 1905; with new form (601) from basalt of East Greenland; Böggild, Medd. om Grönl., **28**, 109, 1905; from Mte. Somma with new form (9.10.0); Cesàro, Bull. Ac. Belg., 334, 1907.

**Anal.** — North Table Mt., Golden, Colo.; Patton, Bull. Geol. Soc. Amer., **11**, 461, 1900; Zs. Kr. **36**, 74; Schiket, Erythræa; D'Achiardi, Rend. Acc. Linc., **11**, (1), 251, 1902; Monte Catini, Tuscany; Manasse, Proc. Soc. Tosc., **15**, 20–37, 1906; Inverell, N. S. W.; Anderson, Rec. Aus. Mus., **6**, 420, 1907.

Chem. constitution; McNeil, Jour. Amer. Chem. Soc., **28**, 600, 1906; Zs. Kr., **44**, 531; Zambonini, Mem. Acc. Sci., Napoli, **14**, 122, 1908.

**Thorianite.** *W. Dunstan*, *Nature*, **59**, 510, 533, 559, 1904. *K. Coomáraswamy*, *Mineralogical Survey of Ceylon*, 1904; *Dunstan and Jones*, [*Proc. Roy. Soc.*, **77**, A, 385, 1906], *Zs. Kr.*, **45**, 286; *E. H. Büchner*, *Proc. Roy. Soc.*, **78**, A, 385, 1906.

Isometric; in cubic crystals, usually more or less water-worn.  $G. = 9.32$ . Color black.

*The Composition of Thorianite.* — Earlier analyses of the rare mineral thorianite from Ceylon, remarkable for its radioactive properties, have been more or less incomplete. An exhaustive chemical examination of this species has now been made by E. H. Büchner, loc. cit. The quantity taken for analysis was 24.373 grams; this was divided by treatment with boiling nitric acid into a soluble and an insoluble portion, these having about the ratio of 40 : 1. The analyses of the soluble portion gave:

ThO <sub>2</sub>	U <sub>3</sub> O <sub>8</sub>	ZrO <sub>2</sub>	SnO <sub>2</sub>	Sb <sub>2</sub> O <sub>4</sub>	Bi <sub>2</sub> O <sub>3</sub> ?	As <sub>2</sub> O <sub>3</sub> ?			
70.96	13.12	0.23	0.05	0.11	0.21	tr.			
Ce <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub>	PbO	CuO	HgO	CdO?	CaO	Residue	
1.96	2.05	0.15	2.46	0.08	tr.	tr.	0.13	1.50	

The insoluble portion gave:

U <sub>3</sub> O <sub>8</sub>	ZrO <sub>2</sub>	TiO <sub>2</sub>	Bi <sub>2</sub> O <sub>3</sub> ?	Fe <sub>2</sub> O <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub>	HgO	CdO?	X*	He	P <sub>2</sub> O <sub>5</sub>	CO <sub>2</sub>	H <sub>2</sub> O
0.02	tr.	0.45	0.15	1.30	0.06	tr.	tr.	0.04	0.15	tr.	0.10	3.20

\* Unknown substance.

The amount of helium yielded from 1 gram was 8.2 c.c. under normal conditions.

The radioactivity of the mineral was found to be 83.3 per cent of standard uranium oxide, a sample several years old. This activity belongs almost entirely to the soluble portion, the ratio of activities being about 300 : 1. The radioactivity of the several precipitates was minutely studied; nearly all showed activity except the alumina, which was absolutely inactive. Calling the activity of the mineral 100, that of the ThO<sub>2</sub> was 57.2, of the U<sub>3</sub>O<sub>8</sub>, 6.6 (later, after several weeks, 9.4), of Fe<sub>2</sub>O<sub>3</sub>, 4.6 (later 5.7), etc.

Obtained from the gem washings of Balangoda, Ceylon, near Kondrugala in Bambarabotuwa, Sabaragamuya, derived from intrusive granitic rocks and associated with thorite, allanite, baddeleyite, gieselite and cassiterite.

Also reported from pegmatite at Gampola, Ceylon.

See under *Uraninite*.

THORITE, *Min.*, pp. 488, 1050; *App.*, p. 68. — See under *Uraninite*.

THURINGITE, *Min.*, p. 657. — Study of thuringite from Thüringen, with anal.; *Zalinski*, *Jb. Min., Beil. Bd.*, **19**, 40, 1904. Occurrence (anal.) with *stilpnochloran* at Gobitschau near Sternberg, Mähren; *Kretschmer*, *Centralbl. Min.*, 195, 1905.

TIN, *Min.*, p. 24. — Crystals formed by electrolysis of tin chloride; *Saposchnikoff*, [*Jour. soc. physico-chimique russe*, **37**, 153, 1905]; *Zs. Kr.*, **44**, 94.

TITANITE, *Min.*, p. 712; *App.*, p. 68. — **Cryst.** — *Vondřichovec* near *Wotitz*, Bohemia, with new forms *N* (20.39.60);  $\sigma$  (141); *e* (4.15.3); *g* (1.24.2); *Krejčí*, *Ber. böhm. Ges. Wiss.*, ix, 1898; from *Pisek*, Bohemia; *id.*, *ibid.*, xlv, 1899; *Lake Baikal*; *Jeremejew*, *Zs. Kr.*, **32**, 495, 1900; *Cappuccini di Albano*, Italy; *Zambonini*, *ibid.*, **37**, 372, 1902; *Pian Real Mt.*, *Susa valley*, Piedmont, with new form (201); *Boeris*, *Att. Soc. Milano*, **41**, 357, 1902; also, *Att. Acc. Torino*, **38**, 692, 1903; *Tollegno and Monte Acuto*, Piedmont; *Zambonini*, *Centralbl. Min.*, 121, 123, 1903; from Switzerland with new forms, (329), (216), (319), (7.5.35); *Hugo*, *ibid.*, 464, 1904; *Skaatö* near *Kragerö*, with new form *R* (113); *Slavík*, *Zs. Kr.*, **39**, 301, 1904; *Biella*, Italy, with optical and chemical study; *Zambonini*, *ibid.*, **40**, 239, 1904; from new localities near *Kragerö*; *Schei* [*Nyt. Mag. Natur.*, **42**, 1, 1904]; *Zs. Kr.*, **43**, 87; granite of *Sardinia*; *Riva*, *Att. Acc. Sc.*, *Napoli*, **12**, No. 9, 1905; *Fedelino*, *Lake Como*; *Repossi*, *Rend. Acc. Linc.*, **15**, (1), 508, 1906; *Somerville*, *Mass.*; *Palache*, *Festschr. siebzigsten Geburtstage*, *H. Rosenbusch*, p. 319, 1906; *Lyon Mt. Clinton Co.*, *N. Y.*; *Whitlock*, *N. Y. State Mus. Bull.*, **107**, 71, 1907; *Druntobel*, *Grisons*, with new form (375); *Cesàro*, *Bull. Ac. Belg.*, 331, 1907.

From *Viez*, near *Bistritz*, Mähren, with anal.; *Kovář* [*Chem. Blätter*, 1899]; *Zs. Kr.*, **34**, 706. Anal. from *Pfisch*, *Tyrol*; *Pfeil*, [*Inaug.-Diss.*, *Heidelberg*, 1901]; *Centralbl. Min.*, 143, 1902. Discussion of chem. constitution; *Zambonini*, *Rend. Acc. Linc.*, **15**, (1), 291, 1906.

TITANOLIVINE, see *Chrysolite*.

TOBERMORITE, *Min.*, p. 570. — New occurrences in Scotland; *Currie*, *Min. Mag.*, **14**, 93.

TOPAZ, *Min.*, p. 492; *App.*, p. 69. — **Cryst.** — From *Pisek*, Bohemia; *Krejčí*, *Ber. böhm. Ges. Wiss.*, xxxv, 1902; *Emmaville* and *Oban*, *N. S. W.*; *Mount Cameron*, *Flinders Island* and *Bell Mount*, *Tasmania*; *Anderson*, *Rec. Aus. Mus.*, **5**, 296, 1904; *ibid.*, **6**, 83-97, 1905; *Cow Flat*, near

Torrington, N. S. W.; Stanthorpe, Queensland; Pakenham, Victoria; Anderson, *ibid.*, **7**, 1, 60, 1908; Greifenstein near Ehrenfriedersdorf, Saxony; Epprechtstein in Fichtelgebirge; Pobershau near Zöblitz, Saxony; Henglein, *Centralbl. Min.*, 367, 1908; Montbelleux, Ille-et-Vilaine, and Colettes, Allier, France; Lacroix, *Bull. Soc. Min.*, **31**, 350, 1908.

Fluorescence in; Schincaglia, [*Il Nuovo Cimento*, Pisa, **10**, 212, 1899]; *Zs. Kr.*, **34**, 312.

Anal. from New South Wales; Harker, *Jour. Roy. Soc. N. S. W.*, **33**, 193, 1899; *Zs. Kr.*, **34**, 213; from Colorado; Tschernik [*Verh. russ. min. Ges.*, **42**, 51, 1904]; *Zs. Kr.*, **43**, 69.

Occurrence near Ouro Preto, Brazil; Derby, *Am. J. Sc.*, **11**, 25, 1901.

TORBENITE, *Min.*, p. 856; *App.*, p. 69. — Etching figures made by cold acid indicate normal tetragonal symmetry, differing from Walker's results (*App. I*, p. 69). Strong absorption shown. On heating mineral to 60°–65° it loses water and becomes normal tetragonal, optically positive; on further heating to 100° it loses more water and becomes orthorhombic (metakupferuranite). Rinne, *Centralbl. Min.*, 618, 1901.

Analysis by Buchholz, *Centralbl. Min.*, 362, 1903, showed 12 molecules of water instead of 8. It was found that 4 were lost in desiccator and 8 on heating.

Occurrence near Ambert, Puy-de-Dôme; Boubée, *Bull. Soc. Min.*, **28**, 243, 1905.

**Torrens site.** *H. Lienau*, *Chem. Ztg.*, **23**, (1), 418, 1899. — A compact reddish gray to sepia-colored mineral occurring with rhodonite at Torrens Mine, Hautes-Pyrénées. Formula given as  $MnSiO_3 \cdot MnCO_3 \cdot \frac{1}{2}H_2O$ . Lacroix, *Bull. Soc. Min.*, **23**, 254, 1900, considers it a mixture of rhodochrosite and rhodonite.

TOURMALINE, *Min.*, pp. 551, 1050; *App.*, p. 69. — **Cryst.** — Twin from Nertschinsk, Siberia; Glinka, [*Verh. russ. min. Ges.*, **35**, 75, 1897]; *Zs. Kr.*, **31**, 509; chrome-tourmaline from Beresowsk; Wernadsky, [*C. R. Soc. Nat. Moscow*, **4**, 4, 1897]. Exhaustive study of the crystallization, pyroelectricity, etc., of tourmaline with long table of angles. Description of crystals from Ceylon; Dekalb, N. Y.; Lincoln Co., N. C.; Gouverneur, N. Y.; Brazil; Paris, Me.; Pierrepont, N. Y.; San Diego, Cal.; Elba; Penig, Saxony; Andreasberg; Mursinka; Worobieff, *Zs. Kr.*, **33**, 263–454, 1900; crystals from granite of Baveno; Artini, *Rend. Acc. Linc.*, **11**, (2), 365, 1902; from Pisek; Bohemia; Krejčí, *Ber. böhm. Ges. Wiss.*, xxxv, 1902; Godegård in Östergötland and from Hammar, Örebro, Sweden; Hamberg, *G. För. Förh.*, **26**, 77, 80, 1904; from Cyrillhof, Westmähren; Slavík, *Bull. Acad. Sci. Bohême*, 1904; San Diego Co., Calif.; Sterrett, *Am. J. Sc.*, **17**, 459, 1904; Karusulik and other localities, Greenland; Böggild, *Min. Grönl.*, 234; Minas Gerais, Brazil, with 2 doubtful new forms; Westergård, *Zs. Kr.*, **42**, 278, 1906; Aukaratra, Madagascar; Termier, *Bull. Soc. Min.*, **31**, 138, 1908; Crown Point, N. Y.; Blake, *Am. J. Sc.*, **25**, 123, 1908.

Study of the crystallographic and optical constants of various tourmalines which have been analyzed. Wülfing, *Progr. z. 82. Jahresfeier d. k. Württemb. Landwirtsch. Akad. Hohenheim*, Stuttgart, 1900; reviewed in *Centralbl. Min.*, 15, 1901; *Zs. Kr.*, **36**, 538.

Pleochroism and polychroism of Elba tourmalines; D'Achiardi, *Proc. Soc. Tosc.*, Jan., 1900; refractive indices measured by Viola; the values suggest either the biaxial character or variation from Fresnel's law, or both, *Zs. Kr.*, **32**, 557; **37**, 120, 1902.

**Anal.** — Tourmaline containing FeO and MnO from Elba; Manasse [*Att. Soc. Toscana*, **11**, 104, 1898–99]; *Zs. Kr.*, **34**, 304; brown tourmaline from McAfee, N. J.; Sargent, *Jour. Amer. Chem. Soc.*, **21**, 858, 1899; Easton, Pa.; Eyerman, *Amer. Geol.*, **34**, 43, 1904; pink crystals from Elba; Schaller, *Am. J. Sc.*, **24**, 157, 1907; *Zs. Kr.*, **44**, 6.

Composition discussed by Clarke, *Am. J. Sc.*, **8**, 111, 1899; Tschermak, *Min. Mitth.*, **19**, 155, 1900; *Zs. Kr.*, **35**, 209, 1901; Rheineck, *Zs. Kr.*, **31**, 385, 1900; Penfield, *Am. J. Sc.*, **10**, 19, 1900.

Alteration; Tschermak, *Min. Mitth.*, **21**, 1, 1902.

**Occ.** — Tourmaline schists from Belcher Hill, Colo.; Patton, *Bull. Geol. Soc. Amer.*, **10**, 21, 1899; *Zs. Kr.*, **34**, 205; Butte, Mon., in quartz; Kunz, [*Eng. Min. Jour.*, **73**, 482, 1902]; *Zs. Kr.*, **38**, 689; in pink to green crystals at Haddam Neck, Conn.; Bowman, *Min. Mag.*, **13**, 108, 1902; Montefano, Italy; Tacconi, *Rend. Acc. Linc.*, **12**, (1), 355, 1903; in chalcocopyrite from Bedovina, Monte Mulatto, Tyrol; Hofmann, *Ber. böhm. Ges. Wiss.*, xvi, 1904; Campolongo, Tessin; Mann, [*Inaug.-Diss.*, Leipzig, 1904]; *Zs. Kr.*, **42**, 665; crystals of gem quality on Kangaroo Island, South Australia; Anderson, *Rec. Aus. Mus.*, **5**, 302, 1904; Tasna, Potosi, Bolivia; *Min. Mag.*, **14**, 333, 1907; Madagascar; Lacroix, *Bull. Min. Soc.*, **31**, 218, 1908.

**Trechmannite.** *R. H. Solly*, *Min. Mag.*, **14**, 75, 1905; 189, 1906; *G. F. Herbert Smith and G. T. Prior*, *ibid.*, **14**, 300, 1907.

Rhombohedral; tetartohedral. Axis  $c = 0.6530$ .

Thirty forms have been observed, the more important being:  $c$  (0001),  $m$  (10 $\bar{1}$ 0),  $D$  (25 $\bar{7}$ 0),  $a$  (11 $\bar{2}$ 0),  $e$  (10 $\bar{1}$ 2),  $s$  (20 $\bar{2}$ 1),  $r$  (10 $\bar{1}$ 1),  $\alpha$  (40 $\bar{4}$ 1),  $n$  (14 $\bar{5}$ 3),  $v$  (12 $\bar{3}$ 1),  $z$  (24 $\bar{6}$ 1),  $g$  (35 $\bar{8}$ 4),  $\zeta$  (35 $\bar{8}$ 1),  $p$  (11 $\bar{2}$ 3).

Crystals very small with prismatic habit, often irregular. Cleavage,  $r$  good,  $c$  distinct. Fracture, conchoidal. Brittle.  $H. = 1\frac{1}{2}$ . Luster, adamantine. Color and streak scarlet-vermilion. Transparent to translucent. Double refraction, fairly strong; negative. Pleochroism weak.

Composition stated to be  $AgAs_2S_3$  (G. T. Prior).

Occurs very sparingly implanted upon tennantite (binnite) in the white dolomite of the Lenggenbach quarry, in the Binnenthal, Switzerland.

This name is also used by Koechlin for an undescribed mineral from the Binnenthal, Min. petr. Mitth., **23**, 552, 1904.

Named after Dr. C. O. Trechmann.

TRIDYMITÉ, Min., p. 192. — Crystals from Ishigamiyama, Prov. Higo, Japan; Wada, Bei. Min. v. Japan, **1**, 17, 1905; Zs. Kr., **43**, 624.

Study of genesis of tridymite in volcanic rocks of Mt. Pelée, Martinique; Laeroix, Bull. Soc. Min., **28**, 56, 1905; from Vesuvius, id., *ibid.*, **31**, 323, 1908.

Artif. formation of tridymite and quartz; Day and Shepherd, Am. J. Sc., **22**, 273, 1906. Formation by action of lightning on roofing slate; Schwantke, Centralbl. Min., **87**, 1904.

TRIPHYLITE, Min., p. 756; App., p. 69. — Intergrown with graffonite from Grafton, N. H.; Penfield, Am. J. Sc., **9**, 20, 1900.

TRIPLITE, Min., p. 777. — Anal. of material from Lilla Elgsjöbrottet, Östergötland, Sweden; Nordenskjöld, G. För. Förh., **24**, 412, 1902; Skruppetorp, Östergötland, Sweden; Hamberg, G. För. Förh., **26**, 77, 1904.

Occurrence with alteration products at Vienna and Cyrillhof, Mähren, with anal.; John, [Verh. geol. R.-Anst. Wien, **60**, 335, 1900, and Kovář and Slavík, *ibid.*, 347]; Zs. Kr., **36**, 641, 642.

TRÖGERITE, Min., p. 859. — Study of crystals from Schneeberg shows that they are apparently tetragonal;  $c = 2.16$ . Forms:  $o$  (001),  $n$  (010),  $\Sigma$  (120),  $y$  (012),  $P$  (011),  $h$  (032),  $i$  (021),  $t$  (111),  $u$  (331). Optically it is monoclinic in symmetry. Author considers mineral tetragonal with optical anomalies. Goldschmidt, Zs. Kr., **31**, 468, 1899.

TRONA, Min., p. 303. — Crystals with new form ( $\bar{1}02$ ) from Vesuvius; see under Vesuvius; from Natroun lakes, Egypt; Couyat, Bull. Soc. Min., **31**, 343, 1908.

TSCHERMIGITE, Min., p. 952. — New occurrence in cubes from Brůx, Bohemia, with anal.; Sachs, Centralbl. Min., 465, 1907; from Schellenken, near Dux, Bohemia; Cornu, *ibid.*, 467.

**Tschernichewite**, an *Amphibole*, which see.

TUNGSTITE, Min., p. 202. — Tungstic ocher from a gold quartz vein near Salmo, B. C., apparently identical with Silliman's tungstite, gave an analysis leading to formula,  $WO_3 \cdot H_2O$ . Only minute crystals observed possessing one perfect cleavage with biaxial interference figure when viewed perpendicular to cleavage. Author considers *meymacite* and *tungstite* to be identical and as having above formula. Walker, Am. J. Sc., **25**, 305, 1908.

TURGITE, Min., p. 245. — Occurrence in iron ore mines of central Russia; Samojloff, [Proc. Soc. Imp. Nat. Moscow, Nr. 6-9, 14-24, 1899]; Zs. Kr., **34**, 701.

TURQUOIS, Min., p. 844; App., p. 70. — Penfield, Am. J. Sc., **10**, 346, 1900, by a new analysis of material from Lincoln Co., Nev. (see below), and a discussion of older analyses, arrives at the conclusion that turquois is a derivative of orthophosphoric acid as follows:  $[Al(OH)_2, Fe(OH)_2, Cu(OH), H]_3PO_4$ .

	$P_2O_5$	$Al_2O_3$	$Fe_2O_3$	CuO	$H_2O$	Insol.
Lincoln Co., Nev. G. = 2.791.	34.18	35.03	1.44	8.57	19.38	0.93 = 99.53

**Tychite**. S. L. Penfield and G. S. Jamieson, Am. J. Sc., **20**, 217, 1905.

Isometric, in small white octahedrons associated with northupite, but very rare. G. = 2.456 (Pratt). Index  $n_y = 1.508$ .

Artificial crystals, believed to be identical in composition, occur also in octahedrons, with H. = 3.5; G. = 2.588; index  $n_y = 1.510$ .

Composition. Qualitative tests showed the natural mineral to be a carbonate and sulphate of magnesium and sodium. Artificial crystals, formed in a manner similar to those by which the associated northupite was obtained (cf. de Schulten, Bull. Soc. Min., **19**, 164, 1896), have the formula,  $2MgCO_3 \cdot 2Na_2CO_3 \cdot Na_2SO_4$ , which is doubtless also that of the natural mineral. The formula of northupite (doubled for comparison) is similar, viz.,  $2MgCO_3 \cdot 2Na_2CO_3 \cdot 2NaCl$ . Cf. Appendix I, p. 49. Analyses of artificial crystals:

	$SO_3$	$CO_2$	MgO	$Na_2O$
1.	15.08	33.55	15.83	35.49 = 99.95
2.	15.06	33.45	15.77	35.65 = 99.93



Penfield and Jamieson in addition to the artificial tychite obtained also a third octahedral compound. The probable formula (written to show the relation to the above) is  $2\text{MgCO}_3 \cdot 2\text{Na}_2\text{CO}_3 \cdot \text{Na}_2\text{CO}_3$ . The three compounds are thus analogous, with  $\text{CO}_3$ ,  $\text{Cl}_2$  and  $\text{SO}_4$  corresponding.

From Borax lake, San Bernardino county, California, obtained with northupite (App. I, p. 49) which it resembles in form and composition (cf. above). It is, however, extremely rare. The examination of some five thousand specimens revealed only four crystals of tychite, the remainder being northupite; by a lucky chance the first crystal tested, of a lot of supposed to be northupite, proved to be a different mineral, and this led to the discovery of this new species, hence its name from  $\tau\upsilon\chi\eta$ , luck or chance.

Isomorphism with northupite, which see.

ULEXITE, Min., p. 887. — Opt. study; Buttgenbach, Ann. Soc. Geol. Belg., **28**, 99, 1900–1901. Synthesis of; de Schulten, C. R., **132**, 1576, 1901.

URANINITE, Min., p. 889; App., p. 70. — Anal. of *bröggerite*; Hofmann and Heidefrie, Ber. Ch. Ges., **34**, 914, 1901.

On radioactive substances in; Debiere, C. R., **129**, 593, 1899; Am. J. Sc., **9**, 143, 1900. Radioactivity of; Barker, Am. J. Sc., **16**, 163, 1903. Ratio of radium to uranium; Boltwood, *ibid.*, **18**, 97, 1904. Lead and helium as disintegration products of uranium in *uraninite*, *mackintoshite*, *ytrocrasite*, *samaraskite*, *annerödite*, *thorite*, *orangite*, *xenotime*, *hielmite*, *polycrase* and *thorianite*. Boltwood, *ibid.*, **23**, 77, 1907.

Occurrence at St. Joachimsthal, Bohemia; Stép, Ber. Akad. Wien, **113**, 585, 1904; at Evje, Sättersdalen, Norway; Schei, [Nyt. Mag., **43**, 137, 1905]; Zs. Kr., **43**, 639.

URANOPHANE, Min., p. 699. — Ratio of radium to uranium; Boltwood, Am. J. Sc., **18**, 97, 1904.

Occurrence at Villeneuve, Ottawa Co., Province of Quebec; Hoffmann, Am. J. Sc., **11**, 152, 1901; from Stone Mountain, Ga. (with anal.); Watson, *ibid.*, **13**, 464, 1902.

URANOSPINITE, Min., p. 858. — Artif. proven to be optically uniaxial and tetragonal; Goldschmidt, Zs. Kr., **31**, 478, 1899.

UTAHITE, Min., p. 966. — Crystals from Santa Rosa Mine, Guánaco, Taltal, Chile. Measured angles not in complete agreement with earlier observations, giving new ratio,  $d = 1.0576$ . Anal. Arzruni and Thaddéeff, Zs. Kr., **31**, 234, 244.

VALENTINITE, Min., p. 199. — Crystals from S. Suergin, Sardinia; Millosevich, Rend. Acc. Linc., **9**, (1), 340, 1900; from Sardinia with new forms, *c* (001), *n* (17.7.0), *t* (4.6.21); Pelloux, Rend. Acc. Linc., **13**, (2), 34, 1904; from Tatasi, Bolivia, with discussion of axial ratio; anal.; Spencer, Min. Mag., **14**, 328, 1907.

Occ. at Cetine di Cortorniano, Rosia, Siena; Pelloux, Rend. Acc. Linc., **10**, (2), 10, 1901; at Prochio, Elba; Cornu and Himmelbauer, [Mitth. Nat. Ver. Wien, **3**, 9–19, 1905]; Zs. Kr., **44**, 299.

Relations to senarmonite, which see.

VANADINITE, Min., p. 773. — Study of crystals from Hillsboro, N. M., showing following new forms: *g* (3140); *f* (5160), *d* (5054),  $\gamma$  (4043),  $\alpha$  (3032),  $\beta$  (5053),  $\pi$  (4041),  $\xi$  (4154), *i* (2132), *e* (3253), *l* (3252), *t* (5272), *p* (4152)? Anal.; Goldschmidt, Zs. Kr., **32**, 561, 1900; from near Saïda, Oran, Algiers; Laeroix, Bull. Soc. Min., **31**, 44, 1908.

Refractive indices; Bowman, Min. Mag., **13**, 324.

Occurrence (with anal.) from Bena e Padru near Ozieri, Sardinia; Lovisato, Rend. Acc. Linc., **12**, (2), 81, 1903; also *ibid.*, **13**, (2), 43, 1904.

Botryoidal from Broken Hill mines, N. W. Rhodesia; Spencer, Min. Mag., **15**, 33, 1908.

Artif. formation of corresponding cadmium compounds; de Schulten, Bull. Soc. Min., **23**, 7, 1900.

**Vanthoffite.** K. Kubierschky, Ber. Ak., Berlin, 407, 1902; Bull. Soc. Min., **28**, 34, 1905.

Almost colorless crystalline (without observed faces) material found associated with other salts at Wilhelmshall, near Stassfurt, and isolated by means of heavy solutions.

Comp.,  $3\text{Na}_2\text{SO}_4 \cdot \text{MgSO}_4$ . Artif. prepared by J. H. van't Hoff, from whom it has been named. See also for discussion of origin, etc., van't Hoff and others in Ber. Ak. Berlin, 499, 1903; 518, 576, 659, 1904.

VESUVIANITE, Min., p. 477; App., p. 71. — **Cryst.** — Crystals from Monzoni, with new forms (552), (631); Buttgenbach, Ann. soc. geol. Belg., **25**, cvi, 1898; Pian Real, Piedmont; Boeris, Att. Soc. Ital. Sc. Nat., Milano, **42**, 45, 1903; Comba Robert near Avigliani, Piedmont; Boeris, Att. Acc. Napoli, **38**, 685, 1903; near Lefte, Bergamo; Tacconi, Rend. Roy. Inst. Lomb., **36**, 899, 1903; Alley Point, Nundle, N. S. W.; Anderson, Rec. Aus. Mus., **5**, 301, 1904; skeleton-like crystals from Maneetsok, Greenland; Böggild., Min. Grönl. 272; crystals from Barraba, N. S. W.; Anderson, Rec. Aus. Mus., **6**, 415, 1907; Sardinia; Pelloux, Rend. Acc. Linc., **17**, (2), 70, 1908; associated with bornite from Susa, Piedmont; Zambonini, Zs. Kr., **45**, 143, 1908.

Relations between optical character and chemical composition; Klein, Ber. Ak. Berlin, 653, 1904.

Anal. of material from the Matterhorn and correction of many old analyses by new water determinations with discussion of chem. comp., formula derived being  $(\text{Ca}, \text{Mn}, \text{Mg}, \text{Fe})_2(\text{Al}, \text{Fe})(\text{OH}, \text{F})\text{Si}_2\text{O}_7$ . Weingarten, [Inaug.-Diss., Heidelberg, 1901]; Centralbl. Min., 726, 1902.

Occurrence (with anal.) from Silver Peak quadrangle, Esmeralda Co., Nev.; Turner, Am. J. Sc., 13, 345, 1902; from near Bear Mt., west of Pinos Altos, Grant Co., N. M.; Moses, *ibid.*, 12, 104, 1901.

*Californite* is a closely compact variety of an olive-green to grass-green color, subtranslucent, luster vitreous to resinous; it resembles jade (*nephrite*) and like that species takes a high polish;  $H. = 6.5$ ;  $G. = 3.286$ . An analysis by F. W. Clarke gave:

SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	FeO	MnO	CaO	MgO	TiO <sub>2</sub>	P <sub>2</sub> O <sub>5</sub>	H <sub>2</sub> O
35.85	18.35	1.67	0.39	0.05	33.5	5.43	0.10	0.02	4.47* = 99.85

\* 0.29 p. c. H<sub>2</sub>O below 100° C. included.

From the South Fork of Indian Creek, 12 miles from Happy Camp and 90 miles from Yreka, Siskiyou Co., California; it is associated with precious serpentine. Similar occurrences are reported from Burro valley, Fresno Co., and from Tulare Co. near Selma (in Fresno Co.). G. F. Kunz, Trans. N. Y. Acad. Sci., Oct. 19, 1903; Am. J. Sc., 16, 397, 1903. On a similar variety of vesuvianite from the Engadine, see Min., p. 480.

**VESUVIUS.** Minerals found at the eruption of April, 1906, include the following; *cotunnite*, *tenorite*, *gypsum*, *hematite*, *aphthitalite*, *sulphur* in crystals, *realgar* in crystals, *galena*, *pyrite*, *chalcopyrite*, *pseudocotunnite*, *anglesite* in crystals, *chalcantinite*, *sylvite*, *halite*, *mirabilite*, *schönite*, *cyanochroite*, *metavoltine*, *amphibole* in crystals, *sodalite* in crystals, *microsommitte*, *carolinite*, *thermonatrite*, *trona*; Zambonini, Rend. Acc. Linc., 15, (2), 235, 1906; Att. Acc. Sc. Napoli, 13, No. 8, 1906; see also Lacroix, C. R., 143, 727, 1906; Bull. Soc. Min., 30, 219, 1907; *ibid.*, 31, 260, 1908.

**Viellaurite.** *H. Lienau*, Chem. Ztg., 23, (1), 418, 1899.—A massive, dark-gray material from near Vielle-Aure, Hautes-Pyrénées, to which the formula,  $5\text{MnCO}_3 \cdot 2\text{Mn}_2\text{SiO}_4$  was assigned. Lacroix examined the material microscopically and proved that it was an intimate mixture of tephroite and rhodochrosite; Bull. Soc. Min., 23, 253, 1900.

**Villiaumite.** *A. Lacroix*, C. R., 146, 213.—Isometric. In small grains of a carmine color. Softer than calcite. Sp. G. = 2.79.  $n_{\text{Na}} = 1.328$ .

Comp.:—Sodium fluoride. Found as a constituent of a nepheline-syenite from the Islands of Los off the coast of Guinea. Named in honor of the explorer Villiaume.

**Violaite**, see under *Pyroxene*.

**VIVIANITE**, Min., p. 814; App., p. 71.—Crystals from Guatemala formed by transformation of bones; Gaubert, Bull. Soc. Min., 27, 212, 1904; from Tatasi and Tasna, Bolivia, with new form *h* (250) and some doubtful ones. Spencer, Min. Mag., 14, 324, 1907; Silver City, Idaho; Farrington and Tillotson, Field Col. Mus., Geol. Series, 3, No. 7, 163, 1908.

A vivianite containing small quantities of manganese and magnesium has been called *paravivianite* by S. Popoff (Centralbl. Min., p. 112, 1906). Occurs in radiated acicular crystals with blue color and streak.  $H. = 2-2.25$ .  $G. = 2.66-2.67$ . Composition,  $\text{R}_3\text{P}_2\text{O}_8 + 8\text{H}_2\text{O}$  with  $\text{R} = \text{Fe}, \text{Mn}, \text{Mg}$ .

Analysis:

P <sub>2</sub> O <sub>5</sub>	FeO	MnO	MgO	CaO	H <sub>2</sub> O
27.01	39.12	2.01	1.92	0.48	[29.46] = 100

Occurs in the limonite deposits of the peninsulas of Kertsch and Taman, Gov't Taurien.

**VOGLITE**, Min., p. 308.—A mineral near voglite from Utsch-Kirtan mountain pass, Fergana, Siberia, with anal.; Antipoff, [Verh. russ. min. Ges., 1900, Prot. 38]; Zs. Kr., 36, 175.

**Vogtite**, see *Rhodonite*.

**Von Diestite.** *E. Cumenge*, Bull. Soc. Min., 22, 25, 1899. A telluride of silver and bismuth. Analysis by Knight:

Ag	Bi	Te	Au	Pb	S	Insol.
40.25	16.31	34.60	4.30	2.25	0.54	0.54 = 98.79

Occurs in threads associated with copper minerals and auriferous pyrite in the Hamilton and Little Gerald mines, on Mt. Sierra Blanca, Col. Named from Mr. von Diest, director of the Lead Mining Co., San Luis, Col.

WARRENITE, Min., p. 120. — Considered to be identical with *jamesonite*, which see; Spencer, Min. Mag., **14**, 207.

WAVELLITE, Min., p. 842; App., p. 71. — From Manziana, Province Rome, Italy, with anal.; Zambonini, Rend. Acc. Linc., **11**, (1), 123, 1902.

**Weinbergerite**; *F. Berwerth*, Min. Mitth., **25**, 181, 1906; Zs. Kr., **45**, 425.

A silicate occurring in spherical aggregates of radiating fibers found in meteoric iron at Codai canal, Palni Hills, Madras, India. Orthorhombic. Black color. Harder than glass.  $a = c$ ,  $b = b$ ,  $c = a$ . Negative. Axial angle small. Refraction and birefringence weak.

Analysis gave:  $\text{SiO}_2$ , 42.00;  $\text{TiO}_2$ , 0.70;  $\text{P}_2\text{O}_5$ , 0.88;  $\text{Fe}_2\text{O}_3$ , 28.75;  $\text{Al}_2\text{O}_3$ , 9.42;  $\text{Cr}_2\text{O}_3$ , 0.98;  $\text{MnO}$ , tr.;  $\text{CaO}$ , 3.87;  $\text{MgO}$ , 4.47;  $\text{K}_2\text{O}$ , 2.57;  $\text{Na}_2\text{O}$ , 3.19;  $\text{H}_2\text{O}$ , 2.17; total, 99.00. The analysis is recalculated, the iron taken as ferrous, the water disregarded and allowance made for the presence of small amounts of apatite and chromite. The result is,  $\text{SiO}_2$ , 45.31;  $\text{FeO}$ , 39.44;  $\text{Al}_2\text{O}_3$ , 10.04;  $\text{Na}_2\text{O}$ , 5.21. The following formula is proposed:  $\text{NaAlSiO}_4 + 3\text{FeSiO}_3$ .

Named in honor of J. Weinberger in Vienna.

WHEWELLITE, Min., p. 993; App., p. 72. — Crystals from Burgk, near Dresden, showed following new forms:  $\nu$  (250),  $a$  (100),  $d$  (032),  $\alpha$  (031),  $g$  (111),  $\gamma$  (122),  $A$  ( $\bar{3}21$ ),  $B$  (341),  $\beta$  ( $\bar{1}31$ ),  $C$  ( $\bar{6}51$ ),  $\delta$  (238) and a new twinning plane  $a$  (100); on crystals from Grube Himmelsfürst near Freiberg, Saxony, following new forms:  $\nu$  (250) and  $\epsilon$  ( $\bar{1}14$ ); and on crystals from Zwickau,  $\nu$  (250),  $\zeta$  ( $\bar{2}11$ ),  $\eta$  (211); Kolbeck and Goldschmidt, Centralbl. Min., 659, 1908.

WHITNEYITE, Min., p. 45. — An intimate mixture of whitneyite and mohawkite (mohawk-whitneyite) found in considerable quantities at the Mohawk mine, Keweenaw Co., Michigan, has been described by Koenig, Am. J. Sc., **10**, 446, 1900. In tough masses, gray and fine granular to hackly on fresh fracture, tarnishing to dull brown or olive-green. Appears homogeneous to the eye, but different samples gave varying amounts of copper (79.36, 83.61, 84.86, 85.36) and arsenic (13.06 to 15.07). Koenig refers here the mohawkite of Ledoux. See *ledouxite*. Cf. also Koenig, Am. J. Sc., **14**, 416, 1902.

WILLEMITE, Min., p. 460; App., p. 72. — Crystals from Musartut, Greenland, with new forms (5270) and (3121); Böggild, Min. Grönl., 276. Occurs sparingly in stout hexagonal prisms of a grayish color on a garnet rock on Modoc Mt., Clifton-Morenci district, Arizona; Lindgren and Hillebrand, Am. J. Sc., **18**, 451, 1904; hemimorphic tetartohedral crystal from Stirling Hill, N. J.; Canfield, Am. J. Sc., **23**, 20, 1907. Crystals associated with diopside at Mindouli, French Congo; Lacroix, Bull. Soc. Min., **31**, 257, 1908.

Refractive indices; Gaubert, Bull. Soc. Min., **30**, 108, 1907.

From Algeria and the Congo; Lacroix, Bull. Soc. Min., **23**, 255, 1900.

**Winchite**, var. of *amphibole*, which see.

WITTICHENITE, Min., p. 128. — See under *Dognacskaite*.

WÖHLERITE, Min., p. 376. — Occurrence in syenite at Red Hill, N. H.; Pirsson and Washington, Am. J. Sc., **23**, 270, 1907.

WOLCHONSKOITE, Min., p. 696. — Occurrence (with anal.) at Uchtyim, Wjatka, Russia; Krotow, [Verh. russ. min. Ges.], **40**, 1, 1903; Zs. Kr., **39**, 609.

WOLFRAMITE, Min., p. 982; App., p. 73. — Crystals from So. Dakota and pseudomorphs after scheelite from Trumbull, Ct.; Warren, Am. J. Sc., **11**, 372, 1901; crystals from Wild Kate mine near Deepwater, N. S. W.; Anderson, Rec. Aus. Mus., **5**, 303, 1904; from Boulder Co., Colo., with new form  $p$  (214); Moses, Am. J. Sc., **20**, 281, 1905; crystals and twin crystals from Ivigtut, Greenland, with new form (610) with anal.; Böggild, Min. Grönl., 180.

Occurrence in Yellow Creek, Black Hills, S. D.; Irving, Trans. Amer. Inst. Min. Eng., **31**, 683, 1902; from Nurri and Orroli, Cagliari, Sardinia; Lovisato, Rend. Acc. Linc., **16**, (1), 632, 1907; from Nagpur Dist., Central Provinces, India; Fermor, Rec. Geol. Sur. India, **36**, 301, 1908.

WOLLASTONITE, Min., pp. 371, 1052; App., p. 73. — Anal. (Christensen) of material from Marraks Elv, Greenland; Böggild, Min. Grönl., 386; from Monte Castelli, Tuscany; Manasse, Proc. Soc. Tosc., **15**, 20–37, 1906.

Effect of ammonium chloride upon; Clarke and Steiger, U. S. G. S., Bull. **207**, 1902; Zs. Kr., **38**, 696.

Effect of radium emanations upon; Baskerville and Lockhart, Am. J. Sc., **20**, 95, 1905.

Artif. formation; Allen, White, Am. J. Sc., **21**, 89, 1906.

Occurrence at Santa Fé Mine, Chiapas, Mexico; Collins, Min. Mag., **13**, 356, 1903; with gold and platinum on Singenggoe river, Sumatra; Hundeshagen, Chem. News., **90**, 77, 1904.

WULFENITE, Min., p. 989; App., p. 73. — **Cryst.** — Sarrabus, Sardinia; Tacconi, Zs. Kr., **32**, 498, 1900; Rend. Acc. Linc., **9**, (1), 22, 1900; Laorea; Artini, Rend. Roy. Inst. Lomb., **33**, 1179, 1900; Gaeta, Lake Como; Repossi, Att. Soc. Milano, **43**, 432, 1905; Bleiberg, Kärnten, Austria; Cesàro, Bull. Ac. Belg., **331**, 1905; with diopside from Mindouli, French Congo; Bull. Soc. Min., **31**, 257, 1908.

Study of symmetry points to its belonging to hemimorphic tetartohedral class; Johnsen, Centralbl. Min., **712**, 1908.

Artif. formation; Cesàro, Bull. Ac. Belg., **327**, 1905.

Occ. at Gennamari, Sardinia; Pelloux, Rend. Acc. Linc., **9**, (2), 13, 1900; at the Collioux mine near St. Luc, Val d'Anniviers, Switzerland; C. Schmidt, Ecl. G. Helvetia, **7**, 139, 1901.

WURTZITE, Min., pp. 70, 1051; App., p. 74. — Relations to sphalerite, which see.

Occurs in Tasmania, at the Hercules mine, Mt. Read, and at the Magnet silver mine, Magnet; W. F. Petter, Notes on Tasmanian Minerals, priv. publ.

**Xalostocite**, a garnet, which see.

XANTHOPHYLLITE, Min., p. 639; App., p. 74. — Discussion of chem. comp.; Zambonini, Mem. Acc. Sci. Napoli, **14**, 31, 1908.

Effect of ammonium chloride upon; Clarke and Steiger, U. S. G. S., Bull. **207**, 1902; Zs. Kr., **38**, 697.

XENOTIME, Min., p. 748; App., p. 74. — Crystals from Pisek, Bohemia; Krejčí, Ber. böhm. Ges. Wiss., xlv, 1899. Crystals from Nil-Saint-Vincent, Brabant; Prinz, Bull. Ac. Belg., **318**, 1904.

Analyses of material from Idaho (?); Tschernik [Verh. russ. min. Ges., **42**, 9, 1905]; Zs. Kr., **43**, 68.

See under uraninite.

**Hussakite**. A xenotime from Dattas, Brazil, was described by Kraus and Reiting, Zs. Kr., **34**, 268, 1901, as containing over 6% SO<sub>3</sub> and given the species name *hussakite*. Later analyses on the same material, Hussak, Centralbl. Min., **533**, 1907, failed to confirm the large amount of SO<sub>3</sub>, only 0.11% being found, so that the name must be withdrawn. Analyses of octahedral crystals from Bandeira do Mello and São Paulo, Brazil, showed only small amounts of SO<sub>3</sub>; 2.68% and 1.19%; Hussak and Reiting, Zs. Kr., **37**, 563. Brögger [Nyt. Mag. Naturvid., **42**, 1, 1904]; Zs. Kr., **41**, 429, discusses composition of xenotime and in anal. of crystal from Arö by Heidenreich no trace of SO<sub>3</sub> could be discovered. *Hussakite* identified as a rock constituent; Rösler, Zs. Kr., **36**, 258, is stated by Hussak, l. c., to have been zircon.

YTRIALITE, Min., p. 512. — Discussion of chem. comp. with new analysis; Hillebrand, Am. J. Sc., **13**, 145, 1902.

Occurrence of eighteen-pound mass at Barringer Hill, Llano Co., Texas; Hidden, *ibid.*, **19**, 425, 1905.

YTROCERITE, Min., p. 182. — Anal. of material from Colorado; Tschernik, [Verh. russ. min. Ges., **42**, 51, 1905]; Zs. Kr., **43**, 69.

**Yttrocrasite**. W. E. Hidden and C. H. Warren, Am. J. Sc., **22**, 515, 1906; Zs. Kr., **43**, 18.

Orthorhombic. Rude crystal found showing three pinacoids, unit prism and one orthodome. Resembled fig. of yttrotantalite, Min., p. 738. Fracture uneven and small conchoidal. H. = 5.5-6. G. = 4.8043. Black in color with bright pitchy to resinous luster. In thin splinters under microscope, rich amber to light yellow color, and with crossed nicols shows a mixture of isotropic and a feebly doubly refracting material.

Comp., a hydrous titanate of the yttrium earths and thorium.

Anal. gives approximately 1R<sup>II</sup>O, 3R<sup>III</sup>O<sub>3</sub>, 1R<sup>IV</sup>O<sub>2</sub>, 16TiO<sub>2</sub>, 6H<sub>2</sub>O. Anal. (Warren):

TiO <sub>2</sub>	Nb <sub>2</sub> O <sub>5</sub>	Ta <sub>2</sub> O <sub>5</sub>	WO <sub>3</sub>	UO <sub>3</sub>	SiO <sub>2</sub>	CO <sub>2</sub>	(Yt,Er) <sub>2</sub> O <sub>3</sub>	Ce <sub>2</sub> O <sub>3</sub> , etc.	Fe <sub>2</sub> O <sub>3</sub>
49.72	present	tr.	1.87	0.64	tr.	0.68	25.67	2.92	1.44
ThO <sub>2</sub>	UO <sub>2</sub>	PbO	MnO	CaO	MgO	H <sub>2</sub> O	H <sub>2</sub> O	= 100.57	
8.75	1.98	0.48	0.13	1.83	tr.	4.36	0.10		

Pyr. B. B. infus., assumes dark gray color and cracks open to slight extent. C. T. decrepitates slightly, gives off H<sub>2</sub>O and CO<sub>2</sub>. Decomposed by HF. Fine powder sol. with slight effervescence in H<sub>2</sub>SO<sub>4</sub>; on addition of HCl and Zn a violet color is first obtained, changing to blue gray and deep blue.

Occ. Found in Burnet Co., Texas, three miles east of Barringer Hill.

See under *Uraninite*.

YTTROTANTALITE, Min., p. 738. — Occurrence in southern Norway with anal. by Blomstrand; Brögger, Min. Süd-Nor. Granitpeg., **152**, 1908.

ZARATITE, Min., p. 306. — Occ. at Igdloukuak, Greenland; Bøggild, Min. Grönland, 176.

ZEAGONITE, see under *Gismondite*.

ZEOLITES, Min., pp. 570-610; App., p. 74. — Chemical constitution; Zambonini, [Mem. Acc. Linc., 5, 344, 6, 102, 1905]; Zs. Kr., 43, 395; Mem. Acc. Sci. Napoli, 14, 88-127, 1908; Ferro, Rend. Acc. Linc., 14, (2), 140, 1905; Baschieri, Proc. Soc. Tosc., March, 1907; Att. Soc. Tosc., 24, 1908; Panichi [Pubbl. R. Ist. Firenze, 1908]; Zambonini, Rend. Acc. Linc., 18, (1), 67, 1909.

Loss of water on ignition as means of identification; Goldschmidt and Hermann; Jb. Min., 1, 20, 1906.

Occurrence in Scotland; Goodchild, [Trans. Geol. Soc. Glasgow, 12, Suppl., 1-68, 1903]; Zs. Kr., 45, 305.

An apparently new zeolite from granite of Baveno, described by Artini; Rend. Acc. Linc., 10, 139, 1901. Monoclinic with apparent orthorhombic symmetry on account of twinning on (100).

$a : b : c = 1.1751 : 1 : 0.7845$ ;  $\beta = 89^\circ 17'.$  Forms (100), (101), (210), ( $\bar{1}01$ ), ( $\bar{1}03$ ). Angles: (100)  $\wedge$  (110) =  $49^\circ 36'$ ; (100)  $\wedge$  ( $\bar{1}01$ ) =  $56^\circ 46'$ ; ( $\bar{1}03$ )  $\wedge$  ( $\bar{1}00$ ) =  $78^\circ 8'$ . In radiating aggregates. Color white. Ax. pl.  $\perp b$  (010);  $B_{x_{ac}} \perp b$  (010).  $2V_{Na} = 47^\circ 13'$ ;  $\beta = 1.58$ .

Formula given as  $Ca_2Al_2Si_6O_{18} \cdot H_2O$ . Analysis:

SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	CaO	MgO	Na <sub>2</sub> O	H <sub>2</sub> O
56.93	15.42	24.47	0.12	0.29	2.49 = 99.72

Fuses easily with intumescence.

**Zeolite mimetica.** *D'Achiardi*, Proc. Soc. Tosc., 14, 150, 1905; 22, 160, 1906; Zs. Kr., 43, 491; 44, 664.

A zeolite from pegmatite at San Piero, Campo, Elba, in small 8 sided prismatic crystals. Easily cleavable parallel to prism faces. Section perpendicular to prism shows a mimetic structure with a division into 8 sectors. White to colorless. H. = 4-4.5. G. = 2.165. B. B. decrepitates, exfoliates and fuses to white enamel. Decomposed by HCl. Formula proposed:  $R^{II}R^{III}_4(Si_2O_6)_9 \cdot 14H_2O$ .  $R^{II} = Na_2, K_2, Ca$ ;  $R^{III} = Al$ . Analysis:

	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	CaO	SrO	K <sub>2</sub> O	Na <sub>2</sub> O	H <sub>2</sub> O
I.	61.41	11.15	5.52	1.14	3.31	2.06	13.51 = 98.10
II.*	62.01	11.35	6.80		3.31	2.06	14.52 = 100.05

\*Li<sub>2</sub>O and Cs<sub>2</sub>O proven to be present in small amount.

Author considers it probably a new species, names it for the present "*Zeolite Mimetica*," but in case future investigation confirms its individuality proposes the name "*darchiardiite*" in honor of his father.

**A New Zeolite.** *A. Pauly*, Zs. Kr., 42, 370, 1906. A zeolite occurring associated with quartz, feldspar, and sericite in a rock lying between a dolomite and a granite at Hainburg, Austria, is considered as a new species with the following characteristics. Isometric, in microscopic grains. Colorless and transparent. Cleavage  $\parallel$  (100). H. = 3-4. G. = 2.4-2.5.  $n_{Na} = 1.507-1.508$ . Gives qualitative tests for Na, Ca, Al, SO<sub>4</sub>, Si and H<sub>2</sub>O. Gelatinizes with HCl. Fuses at 1-2, with intumescence, to a colorless glass. Colors flame yellow.

**Zeophyllite.** *A. Pelikan*, Sitz-ber. Ak. Wien, 111, (1), 334, 1902. *F. Cornu*, Min. petr. Mitth., 24, 127, 131, 207, 1905. *R. Zimmermann*, Centralbl., Min., 245, 1905. Rhombohedral. In spherical or half-spherical forms with radiated foliated structure; these show indistinct rhombohedral faces inclined  $78^\circ$  to c.

Cleavage basal, perfect. Dilute hydrofluoric acid yields ditrigonal etching figures; trigonal contraction figures also appear (Cornu) after etching with hydrochloric acid. H. = 3. G. = 2.764. Luster pearly.

Color white, colorless in thin sections. Translucent. Refractive index  $\omega = 1.5$  approx., 1.545 (Cornu). Birefringence. A uniaxial center surrounded by a biaxial border (2E to  $27\frac{1}{2}^\circ$ ); becomes permanently uniaxial on heating.

Analyses Zdarek:

	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	CaO	MgO	Na <sub>2</sub> O	K <sub>2</sub> O	H <sub>2</sub> O	F
1.	38.84	1.73	0.10	44.32	0.17	0.38	0.24	8.98	8.23 = 102.99 (less O, 3.47) = 99.52
2.	37.67	....	....	46.82	....	....	....	7.52	7.99 = 100

Occurs with natrolite in basalt at Gross-Priessen, Bohemia, north of Leitmeritz and east of Aussig; also (Cornu, Zimmermann) at Radzein, Bohemia, in the amygdaloidal cavities of a leucite-tephrite with calcite, apophyllite, etc.

Cornu refers the gyrolite of the Hebrides, Poonah, etc., to zeophyllite, Centralbl. Min., 80, 1906. New localities, Kreibitz near Rumburg, Scharfenstein near Bensen, and Leipa in Bohemia. Cornu, Centralbl. Min., 80, 1906. See *Gyrolite*.

**Zeyringite.** [Pantz, 1811. Taschenb. Min. (Leonhard), 5, 373], Min. Mag., 14, 414. A finely fibrous, greenish-white or sky-blue calcareous sinter containing nickel, from Zeyring, Styria. Placed under aragonite by Zepharovich (Min. Lexicon Österreich, 1, 28, 1859) and Hatle (Die Minerale des Herzogthums Steiermark, 68, 1885); the latter spells zeiringite.

Zinc, Min., pp. 14, 1052. — Crystals formed by electrolysis of zinc chloride; Saposchnikoff, [Jour. soc. physico-chimique russe, 37, 153, 1905]; Zs. Kr., 44, 94.

ZINCITE, Min., p. 208; App., p. 74. — Artif. crystals from furnace at Falvahütte, Schwientochlowitz, Upper Silesia, with discussion of crystal forms and symmetry; Sachs, Centralbl. Min., 54, 1905; see also Weber, *ibid.*, 205.

Occurrence (with anal.) from Olkuschsk mine in Poland; Antipoff, [Verh. russ. min. Ges. Prot. 38, 41, 1900]; Zs. Kr., 36, 176.

ZINCKENITE, Min., p. 112; App., p. 74. — Analyses of material from Wolfsberg, Harz; Guillemin [Inaug.-Diss., Breslau, 1898], Zs. Kr., 33, 73.

**Zinkrömerite.** R. Scharizer, Zs. Kr., 37, 546, 1903. — See *Römerite*.

ZINNWALDITE, Min., p. 626. — From Narsarsuk, Greenland, with anal.; Flink, Medd. om Grönl., 14, 232, 1898; 24, 110, 1901. Anal. of material from York region, Alaska; Schaller, Am. J. Sc., 24, 158, 1907; Zs. Kr., 44, 7.

ZIRCON, Min., p. 482; App., p. 74. — Crystals from Comba Robert, near Avigliani, Piedmont; Boeris, Att. Acc. Napoli, 38, 685, 1903; crystals associated with gold from Pisek, Bohemia; Krejčí, Bull. Acad. Sci. Bohême, 1904; from various Greenland localities; Boggild, Min. Grönland, 82; from Lyon Mt., Clinton Co., N. Y.; Whitlock, N. Y. State Mus. Bull. 107, 69, 1907.

Cause of color; Spezia [Atti. R. Acc. d. Sc. Turin, 34, 638, 1899], Zs. Kr., 33, 632, see also Stevanovič, Zs. Kr., 37, 622.

Occurrence in Ceylon. Absorption spectrum. Church, Chem. News, 85, 270, 1902.

Study of variation in specific gravity, index of refraction through heating, etc.; notes on crystals from Rio Doce, Brazil; North Carolina; Rothe Wand, Pfitschthal; artificial from Hautefeuille; Stevanovič, Zs. Kr., 37, 247, 1902; see also Koechlin, Min. Mitth., 22, 368, 1903.

Irregularly developed crystals from Ceylon with description of effect of heat upon their physical properties; Spencer, Min. Mag., 14, 43, 1904.

Anal. from Sundsvale, Sweden; Tschernik, [Jour. phys. chim. russe, 36, 457, 712, 1904]; Zs. Kr., 43, 78.

Analysis of a radioactive *malacon*-like material, containing helium and argon; Kitchin and Winterson; Jour. Chem. Soc., 89, 1568, 1906. Discussion of chem. comp. of *malacon*; Zambonini, Mem. Acc. Sci. Napoli, 14, 72, 1908.

Different modifications; Spencer, Geol. Mag., (5), 1, 552; Brit. Ass., 562, 1904.

"*Cyrtolite*" from feldspar quarry at Bedford, N. Y.; Luquer, Am. Geol., 33, 17, 1904.

In granite from Montorfano, Northern Italy; Tacconi, Rend. Acc. Linc., 14, (2), 88, 1905.

*Auerbachite* from the neighborhood of Mariupol, Gov't Ekaterinoslaw, Russia, has been investigated by Jeremejff; it agrees with zircon, but is often much altered; the associated rock is not a siliceous schist but consists of a mass of albite crystals. Bull. Acad. Sci. St. Pet., 7, 89, 1897, Zs. Kr., 31, 512.

ZOISITE, Min., pp. 513, 1035; App., p. 75. — Crystals from Chester, Mass., show following new forms: *g* (510), *h* (410), *i* (950), *j* (540), *y* (221), *A* (212), *B* (141) and several others of doubtful nature; Palache, Am. J. Sc., 24, 249, 1907.

Association with epidote and the chem. and crys. relations of the two species, see under epidote.

Red zoisite from Mähren with anal.; Slavík, Centralbl. Min., 686, 1901. Anal. of material from Monte Corchia, Tuscany; Manasse, Proc. Soc. Tosc., Jan., 1906. Occurrence (with anal.) from Trace mine, Juarez district, Lower California; Farrington, Field Columbian Mus., No. 112; Zs. Kr., 44, 539.

Occurrence near Baltimore, Md.; Am. J. Sc., 11, 171, 1901.









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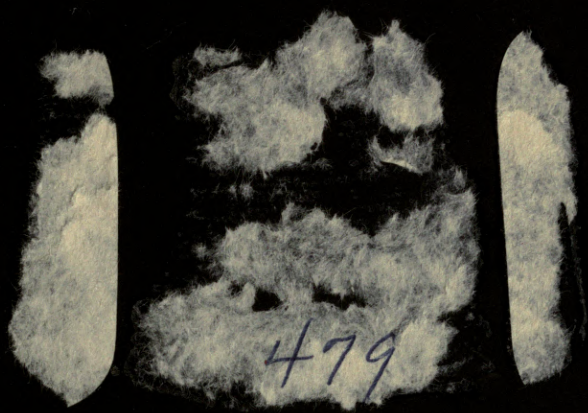
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